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EUROPA ANGUSTIA

EXTERNAL CHARACTERS.—A new species of Phoenix; Size continental; Features varied; Capable of uttering songs and war cries; Food fish, olive leaves and gunpowder; Drink beer, petrol, lubricating oil of an aromatic nature; Beak highly cultured, maxilla red, longer than the yellow mandible, adapted for caressing and pecking; Teeth strangely heterodont, Jurassic sabres and grinders; Eyes, wider than the diameter of the metus, without lids, bluish, expressive of Christian meekness and pagan ferocity; Contour feathers, science, philosophy, art, poetry, religion; Colour cultural, golden yellow; Feathers on the neck erectile; The three divisions of the wings, all arms, aerial, naval and military; Pre-patagium, parachutelike; Remiges, 7, bombers, fighters, spitfires, hurricanes, tanks, machineguns and U-boats; Upper and under wing-coverts, diplomacy and politics; Rectrices, also 7, long-range guns, rifles, shells, handgrenades, bread baskets, beer bottles and incendiary rum flasks; Tail coverts secret pacts: Legs fifth columnists; Toes and claws three, adapted for holding the three Bases.

Internal characters.—Gastric mill an internal combustion engine; Heart, auricles fascist and U.S.S.R., ventricle democratic; Blood, blue, red, and Indian ink; High blood pressure; Occasional brain quakes; Tongue pointed, forked and patriotic, adapted for licking; Excretion, The League of Nations, Disarmament, Versailles.

Psychological characteristics.—A product of technological evolution; Temper sweet but uncertain; Neither reads the New Testament nor keeps the colon open; Visits pictures, haunts theatres; Fond of music; Thirst for gold insatiable.

Nesting habits.—Sex Hermomarsis, technological not biological; Material for nest building barbed wires; Recently laid two totalitarian eggs; Nestlings megalomaniacs, fed on rubber and scrap iron. From out of the ashes may arise a bird of paradise.

Illustration.—Cover page: Lord Raglan's book "The Science of Peace".

IF in the titanic struggle of 1914, the genius of the Rt.-Hon'ble Lloyd George triumphed, the British Empire may rest assured that its fortunes in the present conflict are absolutely safe in the hands of his political brother, the Rt.-Hon'ble Winston Churchill, whose boundless energy, amazing organising power and infectious enthusiasm are an indispensable national asset. In the present critical phase of the war, in which the stake is no less than the precious heritage of human liberty, the duty of every one to whom freedom is as dear as life, is obviously to stand solidly by Great Britain, the last citadel, which the implacable enemy has not succeeded in intimidating or overpowering into submission. The spirit of Britain is harder than steel, and the solidarity of the Empire is stronger than the most indissoluble amalgam. Her resources are inexhaustible. Her kick is more formidable than that of the Giraffe. The dictators are not unaware of the power of Britain, which will soon teach them to behave themselves.

The evolution of modern Europe is virtually the evolution of war technology, and it is not therefore surprising that nations regret that their genius has not been sufficiently harnessed for the invention of more formidable and more destructive engines, than are those employed in the present conflict. When in 1919 the statesmen of the victorious countries sat at the table in the Court of Versailles to draw up the instruments for implementing their war-born political faith of making the world safe for democracy, one could have almost heard the hoarse laughter of that spirit, whose name is unmentionable in polite society, at their unconsciously sowing seeds for a second European conflagration. The present travail of Europe is believed to herald the birth of another politico-social doctrine, to be christened "The New World Order", and this baby is expected to ensure for all the nations of Europe, Peace, Love, Justice and Independence, and to eliminate from their breasts the spirit of bad faith, treachery, intimidation and enslavement. But the War has to be won and won by Great Britain; at the present moment it promises to be long-drawn as was its immediate forerunner. The belligerents are not creating conditions for a speedy termination of the struggle, though the odds are decidedly in favour of the Empire. Her navy enjoys supremacy on the seas. Her military power can hardly be withstood. Her aerial arm is distinguished by the daring exploits which have confused and mastered the enemy's aircraft. The British nation is eager to meet the Nazi hordes and to give them a sound drubbing.

Everybody knows that a decisive victory is possible only after a land engagement. The whole coastline of Western Europe offers more than one point for the landing of an expeditionary force. Under such circumstances one of two things must be done, if the belligerents want to terminate the War. Accept risk, or redefine the terms of war.

The present conflict differs fundamentally from its classical predecessors. The reproach that wars generally place a premium on the uneugenic propagation of the race is now practically removed. We can hardly recollect any period in the history of mankind, when even the most savage enemy selected old men, women, children, schools, churches, hospitals, and art treasures as special targets for destruction, with the object either of creating confusion among the civil population or of breaking the spirit of Government's resistence. In the previous wars the flower of manhood and the excellent traits of national military character may have perished on the battle field, but they reappeared in the succeeding generation, because they are qualities more or less inherent in the national chromosomes. In the wholly indefensible and absurd slaughter of children, we might lose potential Newtons and Darwins; the favourable genes for producing them do not occur with the periodic frequency of planets in the Heavens. Nothing is more senseless than wars, and nothing is more easily or more carelessly provoked. Our religion is war-minded. Our culture is war-based. Our civilization is a war-product. Our mentality is war-tinged. We talk the language of peace, but tread the path of war.

In his work, "Paraphrases on the New Testament," Desiderius Erasmus has dedicated a passage to the Emperor Charles V, whose terrible significance is amazingly illustrated by the present European conflict.

> "May Your Majesty always remember that no war, however just the causes for which it is undertaken, can be carried on with such moderation that it shall not bring in its train a whole host of villainies and misfortunes, and that the evils of war fall, for the most part, upon the innocent."

Further in a letter addressed to a friend, he wrote:

> "I often wonder what it is that urges, I will not say Christians, but men, to such a pitch of madness that they will make every effort, incur expense and meet the greatest dangers, for their mutual destruction. For what else are we doing all our lives but waging war? We are worse than dumb animals, for among them it is only the wild beasts that wage war and even they do not fight among themselves, but with the beasts of a different species, and with weapons which nature has furnished them, not as we do with machines, invented by the art of devil, nor for all manner of causes but either in the defence of their young or for food."

Modern technological civilization and its by-product, Imperialism, have become sociophagous. It is no wonder therefore that, in the circumstances in which the international relations subsist to-day, wars are the inevitable arbiters of disputes provoked by economic rivalries and political jealousies, which are inseparable from the maladjustment of social organisations. The world must develop the spirit of the Eskimo or of the Mahatma, before it can even dream of universal and perpetual peace, love, goodwill and contentment. Dr. Nansen wrote of the Eskimo that "his peacefulness even goes so far that when anything is stolen from him, which seldom happens, he does not as a rule reclaim it, even if he knows who has

taken it". It would seem that the spirit of Christ after his crucifixion, must have selected Greenland as a more hospitable place for the inculcation of the true Christian doctrine of love, where the Heathens can astonish all Christendom by behaving like true Christians. Perhaps the jungle Veddahs of Ceylon are the clearest and the most successfully practical exponents of the impractical doctrine of non-violence. It may be argued that this spirit of pacifism has made these people stagnate, and that, as struggle is the indispensable accompaniment of progress, the hidden capacities of these people have lain dormant for centuries. The Eskimo and the Veddah have by a miracle escaped from the Law of Struggle and the Law of Survival, and this fact alone will entitle them to universal respect.

Within a short space of less than a year after the declaration of the War, Europe has witnessed the fall of some of the richest and the most prosperous kingdoms, and for the moment the Nazi nuisance has spread practically over all the European territories, leaving Great Britain and the remnants of her allies the terrible task of freeing the enslaved countries from the Fascist despotism. Victory may be achieved by one of two ways. He triumphs who sheds more human blood. But human blood behaves like the dragon's teeth. This is the meaning and movement of history. He also triumphs who produces a better plan of settlement. This is the meaning and essence of Christianity. We have tried several experiments for the preservation of Peace—Standing Armies, Armament, Politico-Economic Pacts, Missionaries, Democracy, Commonwealth, Nazism, Communism, Fascism, Revolutions, Republics. The New World Order talks of Politico-Economic adhesions, respect for the integrity of states, secured by co-operation based on loyalty to freedom and to the principles of democracy and for the defence of common interests. This is the old order phrased in a new language. The country that can produce "an order" which is more striking and which is calculated to wean the people of the totalitarian states from the politico-militarist milk of National Socialism, Gestapo and Concentration Camps, perhaps may win a bloodless victory. The articles of such an order would be: (*i*) No Standing Army. No Munition Factories. (*ii*) Every man to be respected as an absolute end in himself. (*iii*) No man to be used as a means for colonial expansion. (*iv*) Work for all. (*v*) Class prerogatives and hereditary privileges replaced by ability, character and power to develop peaceful and fruitful occupations. (*vi*) Conditions favouring economic rivalries, trade competitions, unemployment and political unrest discouraged. Our labours of successive civilizations have been like those of Sisyphus, and the history of political progress has been a circuitous folly. We have to place the wheels of human advancement on a new track, before we can hope to have peace for a reasonable term of our existence.

BLOOD GROUPS AND TYPES*

BY

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What They Are

MICROSCOPICALLY blood is seen to consist of (i) a watery colourless fluid, the *plasma*, and (ii) structures with definite shapes, the *blood cells and platelets*. Most of the structures are biconcave discs coloured yellow, the *red blood cells*, hereafter called *r.b.c.* In the r.b.c. there may exist one, both or neither of two group-specific substances, A and B. In the plasma there may exist one, both or neither of two anti-substances, a and b. A substance and its anti-substance cannot exist side by side in the same subject, because the r.b.c. containing the substance get stuck together, *agglutinated*, or even broken up, *lysed*, in the presence of the anti-substances in the plasma.

The only four combinations compatible with life are the four groups. They are:—

Substance in r.b.c.	Anti-substance in plasma	Designation of blood group in New Nomenclature	Designation of blood group in Old Nomenclature	
			Jansky	Moss
O (= nothing, capital letter)	ab	O	I	IV
A	b	A	II	II
B	a	B	III	III
AB	o (= nothing, small letter)	AB	IV	I

In the New Nomenclature the group is named after the substance. In a *'defective group'* an anti-substance which can exist is absent. The Old Nomenclature should now be forgotten.

How they are Determined

When the blood is shed it clots. From the clot is squeezed out a straw-coloured watery fluid, the *serum*. In the serum are contained the anti-substances of the plasma. Only the serum containing a, serum a, and the serum containing b, serum b, are required. They will determine the four groups, thus:—

If only serum a agglutinates the unknown r.b.c., the group is A.

If only serum b agglutinates the unknown r.b.c., the group is B.

If both sera agglutinate the unknown r.b.c., the group is AB.

If neither serum agglutinates the unknown r.b.c., the group is O.

Sub-Groups

Group A is further divisible into A_1, A_2 and A_3 (Wiener, 1939), *sub-groups*, depending upon a full or a partial affinity only for serum a. A blood may thus be: O; A_1, A_2, and A_3; B; and A_1B, A_2B and A_3B (eight serological divisions instead of four).

Types

In addition but unrelated to the substances A and B there exist in the r.b.c. substances M and N. They differentiate three *types* within each group or sub-group, thus: OM, ON, OMN; A_1M, A_1N, A_1MN; A_2M, A_2N, A_2MN; A_3M, A_3N, A_3MN; BM, BN, BMN; A_1BM, A_1BN, A_1BMN; A_2BM, A_2BN, A_2BMN; and A_3BM, A_3BN, A_3BMN (24 serological divisions instead of 4 or 8).

In the M-N system there is nothing corresponding to O in the A-B system.

How Types are Determined

The substances M and N belong to a class quite different from that of substances A and B. Normally there are no naturally occurring anti-substances corresponding to them in human blood. They are prepared in animals artificially. The principle involved is simple. From OM r.b.c. is prepared *anti OM serum*. The antiserum is absorbed with ON r.b.c. The residue left after absorption is *anti M fluid*. Similarly *anti N fluid* is prepared. The preparation in practice is rather wasteful and tedious (Greval, Chandra and Woodhead, 1939).

Knowing all about the groups, sub-groups and types it is possible to obtain one's own grouping sera and prepare one's own typing antifluids without any extraneous aid. It is

* In this communication technical terms needing explanation have been italicised close to the explanation.

much more convenient, however, to procure the material from laboratories stocking it, to begin with.

Blood Groups, Sub-Groups and Types in Transfusion of Blood and Skin Grafting

In transfusion the ideal arrangement is (*i*) that the recipient and the donor should belong to the same group and (*ii*) that the compatibility of bloods should be established *in vitro* by direct matching. In emergency all recipients can be transfused from a donor of group O, '*Universal Donor*'. Recipients AB, '*Universal Recipients*' can at all times be transfused from donors of all groups. Attention has recently been redrawn to dangerous 'Universal Donors' (De Bakey & Honold, 1938). The same danger also exists in transfusing 'Universal Recipients'. The writer eliminates the danger (Greval and Chandra, 1939). The stored blood needed after air raids should come from safe universal donors. Very recently use of plasma has been recommended. The plasma can also be made safe.

The sub-groups have no significance in transfusion apart from the fact that they lead to error in grouping at times.

The types may have some significance in transfusion and may be responsible for incompatibility within the group as determined by direct matching (Greval and Chandra, *loc. cit.*).

In skin grafting and allied operations the consideration detailed above should also hold.

Blood Groups, Sub-Groups and Types in Genetics

O, A and B are all allelomorphs (contrasting characters). A and B are dominant while O is recessive. Mass statistics have shown that their inheritance follows the Mendelian Law. Further, A_1 is dominant over A_2 which is dominant over A_3.

M and N are both dominant.

Biological subtleties and speculations in genetics have found scope for operation when unexpected groups have turned up. The number of such unexpected occurrences has, however, steadily decreased with improvement in technique.

Blood Groups and Types in Forensic Medicine

From the groups of the parents all the possible groups of the offspring can be determined. It is possible to say that Master Tom *cannot* be the son of Mr. Smith. It is not possible to say that Master Tom *is* the son of Mr. Brown. All that an affirmative evidence can say is that Master Tom *can be* the son of Mr. Brown. The same remarks apply to Mrs. Smith and Mrs. Brown regarding motherhood.

Most workers in forensic medicine do not make use of sub-groups in determining parentage, because of difficulties of technique and consequent uncertainty of results.

M and N are easily determinable and may aid when groups have failed.

The writer has dealt with the question of inheritance of groups and types more fully elsewhere (Greval, 1939, 1940). The following tables give possible and impossible children.

Table I

Blood groups in parents and children

	Parents	Children possible	Children impossible
1	O × O	O	A, B, AB
2	O × A	O, A	B, AB
3	O × B	O, B	A, AB
4	A × A	O, A	B, AB
5	A × B	O, A, B, AB	..
6	B × B	O, B	A, AB
7	O × AB	A, B	O, AB
8	A × AB	A, B, AB	O
9	B × AB	A, B, AB	O
10	AB × AB	A, B, AB	O

Table II

Blood types in parents and children

	Parents	Children possible	Children impossible
1	M × M	M	.. MN N
2	M × MN	M MN ..	.. .. N
3	M × N	.. MN ..	M .. N
4	MN × MN	M MN N	.. .. ..
5	MN × N	.. MN N	M .. ..
6	N × N	.. .. N	M MN ..

The group of a stain of blood can also be determined. It is possible to say whether

a stain can or cannot be derived from the blood of a certain person. Even the saliva may indicate the group.

Blood Groups and Types in Anthropology

The relative distribution of O, A and B, and M and N varies in different countries and communities. A predominates in European and B in Indian population. M and N show similar differences (Greval, Chandra and Woodhead, *loc. cit.*).

A view has been advanced that the original group in man is O, that A and B mutations have arisen in two different and distant foci, and that the present distribution has resulted from mingling of masses of humanity.

Immunologically, indications exist that A_2 and A_3 are nearer O than is A_1. Presumably they are nearer genetically too.

In a comparatively very small survey undertaken so far M and N have also shown marked differences in distribution. They too will indicate movements of masses of humanity when more is known about their distribution.

Blood Groups in Animals

Blood groups in animals also exist though they have not been yet worked out (Snyder, 1929). Interest in monkey gland having waned during the last decade, it can only be mentioned in a whisper that an exponent of rejuvenation passed through Calcutta a few years ago in search of monkeys, elsewhere, whose blood group corresponds as closely as possible to human group O. A graft from O is more likely to take and live than a graft from an unknown group which is likely to be different from the group of the subject rejuvenated.

Blood group distribution in the live-stock will presumably have a co-relation with biological qualities. Breeders may improve their stock by selection of blood groups in addition to or in place of selection of specimens.

De Bakey, M., and Honold, E., *Internat. Med. Digest*, 1931, **33**, 301.

Greval, S. D. S., *Ind. Med. Gaz.*, 1939, **74**, 388.

—, *The Burma Police Journal*, 1940, p. 243.

—, and Chandra, L. S. N., *Ind. Med. Gaz.*, 1939, **74**, 461.

— —, and Woodhead, L. S. F., *Ind. Jour. Med. Res.*, 1939, **26**, 1941.

Snyder, L. H., *Blood Grouping in Relation to Clinicle and Legal Medicine*, The William and Wilkins Company, Baltimore, 1929.

Wiener, A. S., *Blood Groups and Blood Transfusions*, Bailliere, Tindall, and Cox, London, 1939.

EDUCATION DEPARTMENT, OFFICE OF THE HIGH COMMISSIONER FOR INDIA, LONDON

DR. THOMAS QUAYLE'S Report on the activities of the Education Department of the Office of the High Commissioner for India (1938–39) is an impressive document and in the forwarding note we obtain glimpses of the tender solicitude with which the Department was looking after the welfare of Indian students in Great Britain when the international tension culminated in open hostilities in the final month of the year under review. At the beginning of the period there were about 1,514 students, including 131 women, pursuing full-time courses at Universities and Colleges throughout Great Britain, while there were also 118 students taking part-time courses in various branches. In Appendix V to the Report is given a long list of successes achieved by these students, and it is very gratifying to note that a fairly large number of academic honours have come to the share of women. Miss K. N. Bhagvat (Bombay) obtained the PH.D. (Cambridge) in Biochemistry, Miss D. H. Shahaney (United Provinces) was awarded the PH.D. (London) in Bacteriology as a student of the Imperial College of Science and Technology, Miss C. J. Dastur (Central Provinces) gained the B.LITT. degree in English at Oxford, Miss K. E. Bruen (a Government of Burma scholar) got the M.A. degree in Geography of London. In Surgery Miss V. Sankarambal (Mysore) passed the examination for the Fellowship of the Royal College of Surgeons, England. In Section III of this Report, particulars are furnished of the work done by the Department in collaboration with the Indian Stores Department, to find practical training in various branches of industry for the large number of students who each year seek these facilities. It is pointed out that the main difficulty in procuring these facilities arises, not from any racial discrimination, but is due, under pressure of intense trade competition, to the instinct of self-preservation. These trainees ought not to be looked upon as potential competitors, but as collaborators in the development of the Empire of which India is an equal partner.

OBITUARY

PROFESSOR M. T. NARANIENGAR, M.A.

THE numerous old students and the wide circle of mathematical colleagues of Professor M. T. Naraniengar must have received the sad news of his demise with profound sorrow. After a brief illness he passed away on October 9, 1940. India has lost a mathematician of rare ability and a gentleman distinguished for his piety and gentleness. He sought neither greatness nor public recognition, but both found him while unostentatiously discharging his duties. A brilliant graduate of the Madras University, he was early summoned to occupy the Professorial chair of Mathematics in the Central College, of which he was an *alumnus*. He held this post till he retired in 1925. He was one of the professors of the earlier generation who annexed to their teaching duties research work also, and in collaboration with the late Mr. V. Ramaswamy Iyer, he accepted the responsibility of founding the Indian Mathematical Society of whose official organ, he was the Editor from 1909 to 1927. As professor of Mathematics Mr. Naraniengar enjoyed unrivalled popularity and esteem, and as Editor of the *Journal of the Indian Mathematical Society*, he achieved a great reputation for the journal and distinction for himself. Its present international position and its recognised standard are largely the creation of his unstinted devotion to the service of the Society. What the Editor's duties implied may be gathered from his words: "Our main complaint was about the slovenly manner in which manuscripts were prepared and sent up. ... I had invariably to make press copies of questions and solutions, and to prepare diagrams drawn to scale for making blocks. The work of editing all the solutions to a single question would often involve several hours of close scrutiny and fair copying". These words show the scrupulous neatness and exactness on which the Editor insisted and how he exercised his vigilance over the form of presentation of mathematical problems is illustrated by the fact that he had had to return three times Ramanujan's article on "Some Properties of Bernoulli's Numbers", before it assumed an acceptable shape. In recognition of his distinguished services to the Society, an Address was presented to him on the occasion of the Silver Jubilee Celebrations at Bombay in 1932. He was President of the Trivandrum Session of the Indian Mathematical Conference. He shares with Dr. R. P. Paranjpye the distinction of being the first author of one of the first original papers, in mathematics published in India and the stimulus which they have given has resulted in the establishment of flourishing schools of research practically in all the Indian Universities from which there is a steady flow of important research contributions. Mr. Naraniengar's greatness lay in infecting his young colleagues and pupils with a love as great as his own for original investigations in the different departments of mathematical enquiry. He was a man of few words, shy by nature, firm in principles, orthodox in habits and of a blameless record of work and character.

LETTERS TO THE EDITOR

A General Test for Finding whether Two Random Samples are Consubstantial*

The usual method of testing whether two random samples are consubstantial is to test whether the two samples differ significantly in their means; see *e.g.*, R. A. Fisher's "Statistical Methods for Research Workers". This test is accurate only in the case of samples drawn from a normally distributed population. A more general test was given by the writer some time ago.[2] This test too is not entirely free from a defect. However, the following test is quite as general and appears to be flawless. We will consider the simpler case of two equal samples.

Suppose the two samples, containing n individuals each, had been drawn from the same population. In this case each of the $2n$ individuals could have been drawn either in the first sample or in the second. Assuming for the time being that no two out of these $2n$ individuals are alike, it is clear that the pair of samples obtained by us is only one out of ${}_{n}C_{n}/2$ different pairs of samples in which these very individuals could have been drawn. We will now classify these different possible samples in the following manner:

Let the individuals arranged in the order of increasing magnitude be $a_1, a_2, \ldots\ldots\ldots\ldots$ a_{n-21}, a_{2n} and let a_{π} be the median value of this sample.[1] We shall call an individual less than a_{π} an "inferior individual". In general, in each pair of samples one will have more inferior individuals than the other. We shall term this sample the "inferior sample". (If the two samples have the same number of inferior individuals it is immaterial which of them is classed as an inferior sample).

We now divide the different pairs of samples into groups, such that the inferior samples in each group have the same number of inferior individuals. If we give a number to a group equal to the number of inferior individuals in one of its inferior samples, it is clear that the greater the number of a group the smaller is the frequency of pairs of samples in that group.

Assuming the total frequency of the pairs of samples in all these groups to be unity, the frequency of the pairs of samples in groups numbered m, $m+1$, $m+2$, ... and n is

$$f = 2\sum_{r=m}^{n} ({}_{n}C_{r})^{2}/({}_{2n}C_{n}) \quad \ldots\ldots\ldots\ldots \quad \text{I}$$

By rejecting these groups as not belonging to our population the chance of our going wrong is f.

We thus deduce the following test:

Using some limit P for random chance we solve equation I for m after putting $f = P$. Let m_1 be the value.

If the number of inferior individuals in the inferior of our two samples is m_1 or more

* This word was used by Karl Pearson to mean "from the same population".

we say that on the limit P for random chance the two samples were not drawn from the same population.

It should be noted that this test is accurate when all the $2n$ individuals are different. It will, however, be shown in a fuller paper under preparation that even when two or more of the drawn individuals are alike, this test is true to a high degree of approximation in the long run.

We will now apply this test to the following case:—

N. A. F. Moos[2] showed that the observed value of P_0 in the year T during the period 1867–1904 can be "best" represented by $P_0 = -645 \cdot 10^{-5} \quad -68 \cdot 10^{-7} t$, where $t =$ T -1865. In other words, this implied a trend in the same direction.

To test the reality of the trend, the observed values of P_0 were divided into two groups from 1867–1885 in one group and the rest in the other.

The median of the 38 values $= -660 \times 10^{-5}$.

In the second sample (from 1867–85), which is the inferior sample, there are only 10 values less than the median.

Using 5 per cent. as our limit for random chance, *i.e.*, putting f, in equation I, equal to $0 \cdot 05$ and $n = 19$, we solve the equation for m. The value of $m = 14$.

Since the number of inferior individuals in the inferior sample is less than 14, we deduce that the two samples could have reasonably been obtained from the same population. That is to say, on the 5 per cent. limit for random chance the observed trend is not significant.

In conclusion it is hoped that the fuller paper, which is under preparation, will be sent for publication elsewhere before long.

S. R. Savur.

Tambyacha Bungla,
Colaba, Bombay 5,
October 28, 1940.

[1] S. R. Savur, *Proc. Ind. Acad. Sci.*, (A.), 1937, pp. 569.

[2] N. A. F. Moos, *Bombay Magnetic Observations*. 1846–1905, Part I. See page 5.

Constitution of Butrin

Butrin, the glycoside of the flavanone, butin, was isolated by Lal and Dutt[1] from the flowers of *Butea frondosa*. When hydrolysed with dilute sulphuric acid, it gives rise to a molecule of butin and two molecules of glucose. On treatment with excess of ethyl iodide and potassium carbonate, it was reported by Lal[2] to produce a diethyl ether. Assuming that under the conditions of the experiment only phenolic hydroxyl groups are attacked by ethyl iodide, he concluded that butrin was a bioside. In view of certain peculiar features exhibited by butrin its constitution interested us in connection with a general study of the constitution of anthoxanthin glycosides. On treatment with diazomethane, butrin yielded only a monomethyl ether and the latter on hydrolysis gave rise to a monomethyl derivative of butein. Hence the glycoside seems to be not a bioside but a diglucoside of butin, having the two sugar nuclei in two different positions. Experiments aimed at definitely establishing the positions of the glucose groups are under progress. Details will be published elsewhere.

P. Suryaprakasa Rao.

Chemistry Department,
Andhra University,
Waltair,
October 24, 1940.

[1] Lal and Dutt, *J. I. C. S.*, 1935, **12**, 262.

[2] Lal, *J. C. S.*, 1937, 1562.

Magnetic Susceptibilities of Some Halides

The magnetic susceptibilities of a number of fluorides, chlorides, bromides and iodides have been studied by various investigators.[1,2,3] However, several halides have still to be studied. A detailed investigation of some of these substances, has been started in this laboratory. Such an information not only fills the existing gap in our knowledge but also reveals interesting properties.

Mr. Chowdhery has already measured[4] the susceptibilities of some fluorides using Gouy's

method. The present investigation is a continuation of his work and some chlorides and oxychlorides have been studied. The experimental arrangement was the same as that used by him.

We give below the results obtained for the substances. The firm from which each of the following chemicals was obtained is given after the name of the chemical.

Compound	Temperature °C.	$X_m \times 10^7$
1. SbOCl (Antimony oxychloride) (British Drug House)	33·0	− 2·30
2. Carbon trichlorate ($CCl(O_3)_3$) (Theodre Schuchardt)	32·4	− 2·44
3. $PrCl_6 + H_2O$ (Praseodymium chloride) (Haen Works)	34·1	+ 0·18
4. $(C_5H_{11})NCl$ (Tetra-iso-amylammonium chloride) (Haen Works)	33·6	− 5·27
5. $C_2H_4(NH_2)_2$ HCl (Ethyldiamin hydrochloride) (Theodre Schuchardt)	30·6	− 0·79
6. Cr_2Cl_6 + aq (Chromic chloride) (Theodre Schuchardt)	31·0	+ 3·98
7. $FeCl_2 + H_2O$ (Iron chloride) (Haen Works)	34·2	+55·56
8. $CrCl_3$ (Chromium chloride) (Theodre Schuchardt)	33·8	+30·91
9. $TaCl_5$ (Tantalum chloride Sublimed) (Haen Works)	31·0	+ 0·39
10. $ThCl_4 + 8H_2O$ (Thorium chloride) (Merck)	32·2	− 0·34

Detailed account will be published elsewhere.

GHULAM FARID.

Physical Laboratories,
Muslim University,
Aligarh,
October 28, 1940.

[1] A. T. C., Paris, **1937**, **8**.

[2] *Ibid.*, 1937, **17**.

[3] Landoldt and Bornstein, *Table of Constants*, Springer, Berlin, 1923–32.

[4] A. A. Chowdhery, Aligarh Muslim University, *M.Sc. Dissertation*, 1940; *Curr. Sci.*, 1939, **8**, 550.

Vitamin Requirements of the Rice Moth *Corcyra cephalonica*, Staint (Lep.)

THE rice moth is essentially an insect which has a special preference to the starch-rich cereals. This significant circumstance justifies two assumptions. (1) Carbohydrate metabolism must dominate its life process, and (2) Vitamin B_1 requirements of the insect must be indispensable and substantial.

Experiments with a view to investigate the validity of these assumptions, were conducted. An attempt was made to maintain the insects on sago, which is obtained from the pith of palms and cycads in India.

The percentages of the more important constituents of sago and rice are given in Table I, which reveals the low content of protein, fat

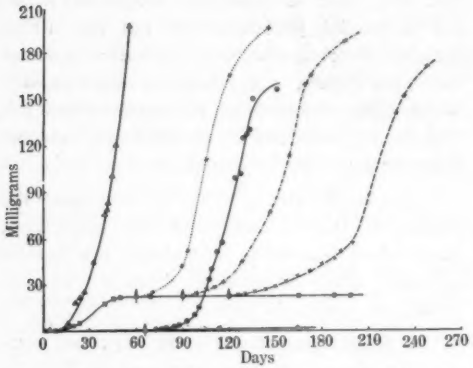
TABLE I

	Sago	Rice
Protein	0·13	7·3
Fat	0·10	1·6
Nitrogen-free Extract	78·16	73·3
Ash	0·16	1·0

and minerals in sago. It was, therefore, thought that sago might constitute a "basal" diet for nutrition work on these insects.

Insects, in batches of 25, were fed on sago; their weights taken at intervals. After 64 days, the insects were given sago which was supplemented by dried yeast to the extent of about 10 per cent. Several other batches of insects were started on a diet containing autoclaved (Vitamin B_1-free) yeast and after maintaining them for different periods on a Vitamin B_1-free diet, they were changed over to a Vitamin B_1 diet (provided in the form of unautoclaved yeast, 10 per cent.) after 30, 60 and 120 days respectively. Two batches of insects, were fed on the full Vitamin B_1 diet from the very commencement. The results are graphically represented in Fig. 1.

It will be seen from Fig. 1, that the insect larvæ, can be maintained on diet of sago but



Sago changed over to active yeast after 64 days of deficiency.

Vit. B_1 Free changed over to Vit. B_1 diet after 30 days of deficiency.

Vit. B_1 Free changed over to Vit. B_1 diet after 60 days of deficiency.

Vit. B_1 Free changed over to Vit. B_1 diet after 120 days of deficiency.

Vit. B_1 Diet.

Vit. B_1 Free Diet.

Sago.

practically, they do not put on any growth. When these "sago-fed" insects are transferred to a diet of yeast and sago, they begin to grow rapidly. Autoclaved yeast diet promotes the growth of the larvæ, during the first forty days to a small extent, but the growth comes to a dead stop after this period as will be seen from the curve. When batches of these insects are changed over to an unautoclaved-B_1-diet, the growth is resumed and the final weights which the larvæ attain, practically correspond to the weight reached by the batch of larvæ fed on the full diet from the very commencement.

It will, however, be observed, that the period for the attainment of the full growth, differs with the preceding period of "starvation" on a Vitamin B_1-free diet. It is remarkable that the insect should retain its power of recuperation after such a long period of starvation—a period, during which it should have, under normal conditions, gone through practically two generations.

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November 5, 1940.

The Nomenclature of Brassica Species

WHILE there appears to be little confusion in Europe and in North America about the naming of turnips, swedes and rapes (see Table), in India the names for the oil-seed crops sarson and toria still seem to cause some trouble. Thus in a recent note [Mohammad and Sikka (1940)] toria is called *B. napus*, L. var. *dichotoma* Prain in the table and *B. campestris* L. var. *dichotoma* Prain in the text. If we first consider the nomenclature of European types (see Table), we can suggest that *B. campestris* L. should be reserved for types in which the chromosome number is $2n = 20$ and *B. napus* L. for types with a chromosome number of $2n = 38$.

Common name	Name according to Robson (1934)	Name according to Bailey (1922)	Somatic chromosome No.
White-fleshed swede	*B. napobrassica* D. C.	*B. napobrassica* Mill	38
Yellow-fleshed swede	*B. rutabaga* L.	*B. napobrassica* Mill	38
Swede rape	*B. napus* L.	*B. napus* L.	38
White-fleshed turnip	*B. rapa* L.	*B. rapa* L.	20
Yellow-fleshed turnip	*B. rapa* L.	*B. rapa* L.	20
Turnip rape	*B. campestris* L.	*B. campestris* L.	20

Now both sarson and toria have a chromosome number of $2n = 20$ [Alam (1936)]. So it would appear that the botanical names should be *B. campestris* L. var. *sarson* and *B. campestris* L. var. *toria* respectively. The clumsy names, *B. campestris* subsp. *campestris* var. *dichotoma*

and *B. campestris* subsp. *napus* var. *toria*, as used by Alam (1936) should also be avoided.

It would also appear that one name only was needed for the two types of swede since these may differ by only two genes [Davey (1932)]. It is also possible to include both the swede rape and the swede in the same species and to call the swede *B. napus* L. var. *napobrassica* (L.) Petrm. (see Davey, 1932). It would seem, however, from comparison with the turnip species, to be useful to reserve *B. napus* for the swede rape and to call the swede itself *B. napobrassica* Mill.

In conclusion one would like to emphasise that in future the name *B. campestris* should be reserved for forms with $2n = 20$ and the name *B. napus* for forms with $2n = 38$. Forms with $2n = 20$ should not have the name *napus* in their botanical names.

H. W. Howard.

School of Agriculture,
Cambridge,
September 14, 1940.

Alam, Z., *Ann. Bot., London*, 1936, **50**, 85.

Bailey, L. H., *Gentes Herbarum, Fasc. II*, 1922, 53, Ithaka, New York.

Davey, V. McM., *J. Genet.*, 1932, **25**, 183.

Mohammad, A., and Sikka, S. M., *Curr. Sci.*, 1940, **9**, 280.

Robson, W. S., *Ann. Applied Biol.*, 1934 **21**, 418.

Diagenesis *versus* Mutation

A common European insect, *Cicadella viridis*, contains two symbiotic micro-organisms. One belongs to the mysterious group, Cicadomyces, supposed to be allied to yeasts and found only among homopterous insects; and the other is a long bacterium. It has been explained[1] that the so-called Cicadomyces are but protoplasmic debris, while the real germs have hitherto been mistaken for cell-granules or pigment-granules. The long bacterium produces β-Carotene; the other bacterium forms short rods and produces an olive-yellow pigment whose chemical nature is unknown.

On cultivating the above bacteria from insect-tumours, or Bacteriotomes, formerly called mycotomes, they grow together. At first their joint pigmentation is bright yellow while after some three weeks there appear orange-red spots showing it to be a mixed colony. The yellow bacterium can be easily separated and in pure cultures gives rise to the greenish-yellow pigment. The red bacterium is always dependent on its yellow companion or is a commensal of the latter. Both bacteria belong to the group Mycobacteriaceæ. The bright yellow colouration of their colony is due to the mixed pigmentation of these two bacteria.

The red bacterium grows very slowly on all media tried so far and must be classed as dysgonic, whereas the yellow companion grows faster or is eugonic; these terms were first introduced in the study of the tubercular germ, also a species of Mycobacteriaceæ. When a commensal is at the same time dysgonic, i.e., where one-sided symbiosis is accompanied by a differential rate of growth, a new phenomenon also appears. The impression gained on cultivating the micro-organisms of *Cicadella viridis* is that the red bacterium appears as a result of later contamination, whereas it is to be interpreted as latent infection, the dysgonic partner being present from the very beginning. Such a subsequent growth of another bacterium can be misinterpreted as an instance of mutation by an observer who took care to exclude all further chances of contamination. Such cases, I believe, have been actually reported in the literature as genuine mutations while critics have unduly stressed the possibility of a subsequent contamination having occurred in some mysterious way, both overlooking the probability of a latent infection. The importance of this phenomenon was kindly pointed out to me by my friend, Prof. Kollath of Rostock, who also suggested that a new term may be coined for the purpose. Epigenesis means, growing after, and would have been a suitable term but it is unfortunately pre-occupied so that it is proposed to introduce the word Diagenesis. It signifies the deferred appearance, even after subculturing, of a latent infection where a dysgonic bacterium *grows through* (Dia = through) the main colony

which has been formed by its eugonic partner. Along with Diagenesis there may or may not be commensalism but the presence of a dysgonic partner is essential for this phenomenon. In this connection it may be reminded that while isolating germs from stool, soil or similar natural sources a commensal may grow independently since the medium supplied in the laboratory may be superior to that offered by nature which would make it difficult to ascertain if a diagenete is not also a commensal in its natural environment. Diagenesis might have been designated Pseudo-mutation but it is not so expressive.

When a tissue is considered sterile it implies that experiments to isolate germs possibly associated with it have all given negative results. The controversy if certain cell-inclusions, which on account of their size resemble cell granules, are real germs can only be decided by the application of the bacteriological technique. That is also the crux of the Cancer problem. In the same way if a germ is commensal or not depends upon the composition of the media tried. However the red bacterium seems to be a true commensal for even in the bacteriotomes of the insect, where it can be easily recognised on account of its large size, it is invariably associated with the short rods of its yellow partner. Buchner[2] unwittingly illustrates a Bacteriocyte (replacing the older designation Mycotocyte), with bacteria of two different sizes, long rods of the red and elongated dots of the yellow bacteria, whereas the picture is intended to represent only one kind of bacterium.

The isolation of these bacteria and ultimate separation of the red commensal was undertaken at the Institute of Hygiene, Leipzig, where the Director, Prof. Dresel, kindly offered all possible facilities. The famous Firm, Merck of Darmstadt sent me gratis some nicotinic acid amide, a costly substance, not available on the market, for which I am specially obliged. With the addition of nicotinic acid amide to prune juice agar the commensal grew independently. If the original medium were naturally rich in this substance no commensalism would have been noticed. The red pigment of the commensal easily distinguished it from the greenish-yellow pigment of the eugonic partner and it was really due to the differential pigmentation that the existence of a mixed infection became self-evident. If the probability of a latent infection be denied it is still more difficult to believe how a bacterium, even before it develops a large colony, would repeatedly give rise to an identical mutation. In fact the yellow bacterium, which is also the dominant one, in pure cultures has never produced a mutant. The red bacterium has done so and will be reported elsewhere. Pigment producing bacteria are rarely studied and those mentioned here also give a clue as to how, elsewhere, in a mixed colony where no pigment is formed, a diagenete may be easily mistaken for a genuine mutant. Even repeated sub-cultures would not assure the purity of a culture for it would not exclude the possibility of diagenesis. In such cases the technique of single cell culture alone must be resorted to in order to obtain a pure culture.

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Osmania Medical College,
Hyderabad (Dn.),
October 1, 1940.

[1] *Verhand. deutsch Zool. Ges.*, 1939, p. 420.
[2] *Zeit. f. Morph. u. Oekologie*, 1925, **4**, 137.

Sugarcane Smut in Bihar

THE existence of smut has been noted in Bihar this year during the months preceding the monsoon in parts where smut was not recorded before. The disease usually manifests itself after the monsoon when the cane is more or less mature and an earlier appearance is an indication of its severity. A few features of interest in this connection are described below:

In May when the crop was three months old thin cane stems with internodes varying from 1·5"–3" in length could be seen in the affected shoots (Fig. 1). Butler's[1] suggestion that the smutted whip might be a floral shoot indicated that the development of the stem in the young diseased cane was probably a case of induced

FIG. 1
Stem-formation in three months old cane with smutted whip

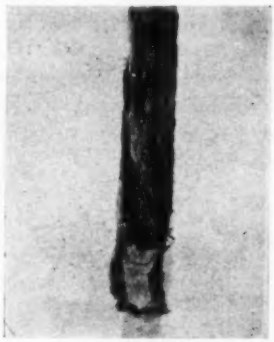

FIG. 2
Swollen base and corrugated surface of smutted whip

FIG. 3
Much coiled smutted whip. Below was a spike of flowers

maturity. During July interesting cases of spike formation were met with in the fields in five months old crop affected with smut—the spikes being borne on the younger shoots of the clump while the older ones were smutted. A very interesting case was one in which a flower-bearing spike terminated in a much coiled smutted whip which bore viable spores (Fig. 3).

It was observed in a few cases that the base of the whip has a swollen appearance, somewhat like a gall varying in diameter from 1"–2" (Fig. 2). The spores were borne on the surface of the dark corrugated tissue. The sporiferous whips associated with the galls were short and stumpy and more or less erect while the normal whips were long, smooth and much curved on themselves.

Certain grubs were found voraciously feeding on the smut spores. A few of them were collected and fed on spores and a week later small beetles emerged from them. The beetles have been sent for identification. The rôle that they play in this disease is under investigation.

The collections of spores made from several localities were critically examined for morphologic variations. In colour, spore-wall, minutely punctate spore surface and mean diameter of the spores the collections from most of the parts agreed closely with *Ustilago scitaminia* Syd. One collection from Buxar in South Bihar, however, resembled *Ustilago scitaminia* Syd. var. *Sacchari-Barberi* Mundkur.[2]

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Mycology Section,
Sugarcane Research Station,
Pusa, Bihar,
August 18, 1940.

[1] Butler, E. J., *Fungi and Disease in Plants* (Thacker Spink & Co., Calcutta and Simla), 1918.
[2] Mundkur, B. B., *Kew Bul.*, 1939, No. 10.

A Malformation of Cotton Leaves

IN the experimental plots on the study of the effect of time of sowing on the incidence of root-rot disease of cotton, the leaves of plants of Mollisoni 39 (*G. arboreum* var. *neglectum*) and the Punjab-American variety L.S.S. (*G. hirsutum*) cottons sown in the first week of

April were observed to have inward rolling of their margins. About 70 per cent. of the plants were affected. The first symptoms of curling of the leaves were observed in 1939, about four to five weeks after sowing (i.e., about first week of May), but it occurred this year in a rather severe form. In the cottons sown in May, which is the normal time of sowing such curling of the leaves has been observed rarely. The leaves of last year's ratooned crop were also found to be affected.

The leaves may be partially rolled inward to form a sort of pocket or the entire margin of the leaves may turn inward to form a complete pouch. The first leaves appear to be almost normal but those formed later are thick, leathery in texture and are brittle. The diseased leaves are somewhat darker in colour than the normal leaves and if viewed against light the veins appear to be colourless.

After several weeks, the new leaves on the affected plants appear to be almost normal whereas the affected leaves are retained by the plants for sometime and further progress of the disease apparently, almost ceases. Later, the diseased leaves turn pale, dry up and are shed. This malformation seems to be different from that recorded by Mohammad Afzal[1] as it occurs in both indigenous and exotic varieties and as no diminution of plant organs is observed as plants advance in age. Fig. 1 shows healthy and affected plants.

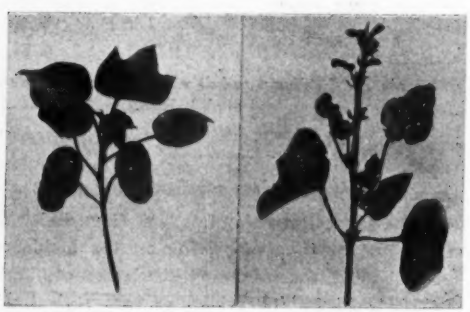

FIG. 1

Healthy plant Affected plant

The affected leaves are histologically different from healthy leaves. The former are almost double the thickness as compared to the normal leaves. The epidermis of the affected leaves appear to be crumpled whereas in the normal leaves the epidermis and cuticle are regular and well-defined. The lower epidermis of the affected leaves showed irregular margins and this possibly explains the wrinkled appearance of the leaf surface. The palisade cells have comparatively more inter-cellular spaces and are almost 1¾ times the length in comparison to the normal healthy ones but in some places the palisade cells, rather than having developed

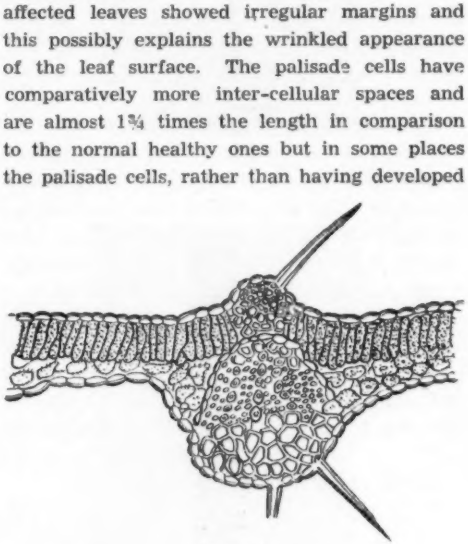

FIG. 2

Transverse Section of Healthy Cotton Leaf. (× 50)

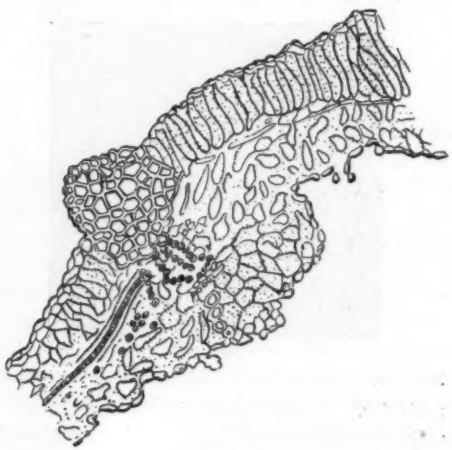

FIG. 3

Transverse Section of Affected Cotton Leaf. (× 50)

extra length, are distorted and irregular in shape. The spongy parenchyma in the diseased leaves is irregular and loosely arranged, so that there are many intercellular spaces. Plastids in the palisade cells of the affected leaves are very few and the cells appear almost colourless whereas the palisade cells of the healthy leaves are closely arranged and full of chloroplasts. The sclerenchyma cells of the mid-rib of diseased leaves are bigger but those of healthy leaves are smaller in size and compactly arranged. Figs. 2 and 3 show transverse sections through a healthy and an affected leaf respectively.

Table I gives the results of analysis of the healthy and affected leaves (mgm. per 100 gm.). Samples were collected from healthy and diseased plants standing close to each other in the same field and are comparable with respect to age, size and height.

TABLE I

	Fresh leaf materials			Dry leaf material	
	Total sugars	Reducing sugars	Sucrose	Starch	Nitrogen
Healthy ..	767	549	218	25·9	2·7
Diseased ..	590	466	124	20·7	1·1

The composition of the ash is given in Table II.

TABLE II

	Ash	Hcl. sol. ash	CaO	MgO	P_2O_5	Fe	K O	Na_2O
	Per cent. of dry material							
Healthy	19·25	17·12	5·12	0·80	0·81	0·11	3·64	0·13
Diseased	33·63	21·88	6·44	0·75	1·08	0·45	4·44	0·14

The data given above show that the affected leaves are characterised by (1) decrease in total sugars, reducing sugars, sucrose and starch, (2) lower nitrogen and (3) higher ash content.

Attempts to transmit the disease to healthy plants by the more usual methods have failed so far.

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Lyallpur,
October 29, 1940.

[1] Mohammad Afzal, Santokh Singh Jaggi and Bishan Singh, *Ind. J. Agric. Sci.*, 1935, **5**, 324.

The Beneficial Effect of Boron on Jute

LAST year in the course of an investigation on jute plants grown in pots filled with manured soil and kept in open, it was noticed that many of the plants developed a characteristic injury; the topmost bud leaves and a few other assimilating leaves shrivelled and fell off; the apex of the stem also withered, became brown at first and ultimately blackened; the injury then spread downwards. This type of injury commonly designated 'dieback' was not observed in plants grown in a trial plot. Similar injury reported in literature, has been traced to (1) deficiency of boron,[1,2] potassium[3] or moisture[4] in the soil, (2) the addition of ammoniacal fertilizers[5] or (3) frost.[6]

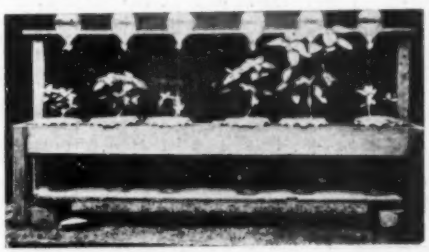

FIG. 1

Jute grown from seeds in sand culture with and without the addition of boric acid. The control is on the left. The plants on the right of this received respectively 0·01 p.p.m., 10·0 p.p.m., 0·5 p.p.m., 0·1 p.p.m. and 1·0 p.p.m. The plants were irrigated by the drip and drain method.

Jute (*Corchorus capsularis*) seeds were obtained from the Agri-Horticultural Society of Bengal and those with almost the same size and

weight were selected. They were soaked in distilled water for 10 to 15 minutes and 4 to 5 seeds were sown on 24th May in sterilised pots filled with boron-free sand and soaked in distilled water. When the seedlings were ten days old, the pots were thinned out, only 2 plants being allowed to remain in each pot; the pots irrigated with Hoagland's solution. Boron (as boric acid) was added in six different concentrations. The plants were grown for 42 days before harvesting. The first set of five plants was removed on the 16th July, the roots were washed free from sand and the lengths of stem and petiole taken. Readings of the surface area of the leaves were taken by a planimeter. The plants were then cut into tops and roots and the fresh and dry weights determined. These results are tabulated below.

TABLE I

Concentration of boron p.p.m.	Average of five plants						
	Total height cm.	Area of leaf sq. cm.	Length of petiole cm.	Fresh weight of plants gm.		Dry weight of plants gm.	
				Tops	Roots	Tops	Roots
	33·3	175·4	33·7	4·09	0·52	0·49	0·11
0·01	50·7	318·9	48·3	8·38	1·54	1·03	0·17
0·1	73·7	645·8	87·0	19·87	2·82	2·37	0·43
0·5	53·0	325·3	48·9	8·24	1·10	0·99	0·15
1·0	24·7	119·7	20·9	1·19	0·41	0·26	0·07
10·0	24·0	82·8	18·2	1·76	0·41	0·23	0·06
Control in composted soil	54·2	407·4	57·1	10·53	1·44	1·22	0·17

Plants receiving no boron were fairly healthy; only the leaves of the plants were not as green as those of plants receiving boron. Plants receiving concentrations of boron from as low as 0·01 p.p.m. to 0·5 p.p.m. were quite healthy. Those in pots receiving 0·1 p.p.m. of boron showed maximum growth. Higher concentration of boron proved distinctly toxic; thus those receiving 1 p.p.m. and 10 p.p.m. showed yellowing of leaves, the leaves themselves being deeply cupped on the under-surface. The growth was also poor. The special meristems in some cases died and the axillary buds that developed were all yellowish in colour. Roots were very poorly developed.

It was observed that all plants were prone to dieback, thus showing that this effect was not due to boron.

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Bose Research Institute,
Calcutta,
September 10, 1940.

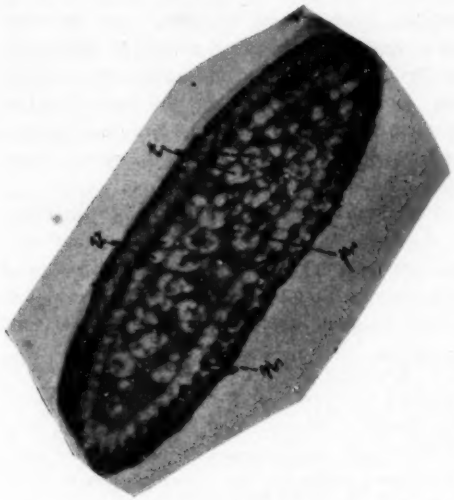
[1] McMurtrey, J. E., *J. Agri. Res.*, 1929, **38**, 371.
[2] Warington, K., *Ann. Bot.*, 1923, **37**, 329.
[3] Hartt, C. E., *Bot Gaz.*, 1929, **88**, 229.
[4] Heald, F. D., *Manual of Plant Diseases*, McGraw-Hill Book Co., Inc., 1933, p. 99.
[5] Floyd, B. F., *Fla. Agr. Exp. Sta. Bul.*, 1917, **140**, 1.
[6] Heald, F. D., *Manual of Plant Diseases*, McGraw-Hill Book Co., Inc., 1933, p. 169.

The Nervous System of a Proglottid of *Tentacularia macropora*

THE nervous system of Cestodes was first discovered by J. Muller[1] in *Tetrarhynchus attenuatus*. But in spite of the attempts of Lang,[2] Lönnberg,[3] Pintner[4] and Johnstone[5] the arrangement of the nerves in the proglottides in Tetrarhynchids is even now not known. The supposition is that there should be two lateral nerve cords running the whole length of the proglottid chain. The difficulty experienced by the students of the nervous system of invertebrates is more marked in the case of Cestodes. Most of the previous investigators seem to have either not employed the silver methods or have failed to obtain a sufficiently satisfactory impregnation of the fibres. This may probably be due to non-availability of sufficient material.

In March and July 1940 I obtained a number of *Tentacularia macropora* (Shipley and Hornell, 1906) from the spiral valve of *Stegostoma tigrinum*. After repeated experiments with the Bielchowsky technique I have obtained

some good impregnations of the nerve fibrils in the proglottides. The results are rather interesting. The nervous system is constituted in the proglottid by a large number of nerve cords all of which seem to be of equal thickness. Photo-micrograph is a transverse section of a maturing proglottid. It will be seen



that there are about 60 nerve cords (*n*). They lie outside the circular row of vitelline glands and fibres leaving these could be seen proceeding towards the cuticle as well as the organs in the medulla. Some of the fibres going towards the cuticle seem to innervate the subcuticular longitudinal muscles, while others end on the cuticle itself. The fibrils which proceed to innervate the organs in the medulla present a very curious arrangement. There is a fibrillar plexus (*p*) between the vitelline glands (*v*) and the testicular vesicles (*t*). This is formed by the individual fibrils of bundles leaving the nerve cord, separating after passing between the vitelline glands and forming a complex network. The plexus is thicker on the sides of the two large lateral excretory vessels than in the other regions. Innervation of the various organs is not by branches from the nerves but by fibrils from this plexus. Due to the formation of a plexus it is almost impossible to trace the nerve fibrils from the nerve cords to the tissue or organ innervated. Transverse sections show that some fibrils from the plexus also end in the cuticle.

From longitudinal sections it appears that the plexus is well marked only in the anterior half of the proglottid where testicular vesicles are present in the medulla. In the posterior half of the segment, the medulla has the appearance of a meshwork due to the presence of innumerable intercrossing fibrils. The ovary is innervated by bundles of fibrils proceeding directly from the nerve cords. Near the outer margin of the organ the fibrils separate and proceed to the various regions of the gland.

It will be seen that the nervous system is remarkably complex and not what was supposed to be the case by the previous authors. The nerve cords are not compact and neither do they appear to possess sheaths. There are no ganglionic enlargements and the ganglionic cells that occur are mostly bipolar. Considering the uniform environment in which these worms live and the strictly limited necessity for co-ordinated movement, the complex arrangement of nerve fibrils is rather surprising.

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Department of Zoology,
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Triplicane, Madras,
October 20, 1940.

Magification of Photomicrograph × ca 100.

[1] Muller, J., *Muller's Archiv. f Anat. Phys. Jahr.*, 1836.

[2] Lang, A., *Mith d Zool. Stat. Neapel, Bd.* II, 1881, 372-400.

[3] Lönnberg, E., *Bihang Till K. Svenska. Vet. Akad. Handl.*, 1889, **15.**

[4] Pintner, Th., *Arb. a d Zool. Inst. d. Univ. Wien*, 1881; *Abstract in Jour. Roy. Micr. Soc. (2)*, 1831, **1**, 458-60.

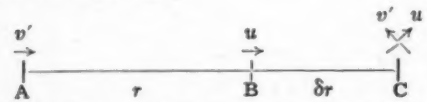
[5] Johnstone, J., *Parasitology*, 1911, **4**, 364 416.

Some Observations on Sir Shah Sulaiman's Theories—II

In the December 1937 issue of *Current Science*, I published an analysis of Sir Shah Sulaiman's theories and gave some indications of their untenable character. The author of these theories was good enough to reply in the March 1938 issue of the same Journal. I now return to the subject once more and as I do not wish to consume much space, interested readers will kindly peruse the present article in conjunction with the other two referred to above.

1. Sir S. M. Sulaiman's view that relative velocity is a certain function of the individual velocities concerned and not their simple difference was scrutinised and elements of self-contradiction for his basic theory were illustrated through a particular formula adopted by him (and which he used to obtain Fresnel's Coefficient, etc.). In his reply the author expressed the idea that he was not concerned with the unavoidable "errors" in such formulæ (although I had throughout pointed out that they were *contradictory* of his premises and therefore altogether inadmissible) but that he could utilise any of them because the actual difference between individual velocities being, according to him, unobtainable, nothing really could exclude their use.

Here I shall endeavour, briefly, to establish that, as the foundations of Sir Shah Sulaiman's theory are the beliefs in absolute space and time (and as all varieties of Kinematics develop from assumptions as to these fundamentals), relative velocity and the difference between actual velocities must of logical necessity be one and the same thing.



Let there be two bodies with velocities, manner of departures and meeting points as indicated in the figure; we can get

$$\frac{r+\delta r}{v'}=\frac{\delta r}{u}\,(=t)$$

Eliminating δr, we have

$$\frac{r}{v'-u}=t \quad .. \quad .. \quad .. \quad \text{(i)}$$

The concept of relative velocity has nowhere been used to reach (i). Now, let us, as *different observers on the bodies*, taking the relative velocities of the bodies to be some indefinite function $f(v',u)$, perform the calculations. As space and time are assumed to be absolute, we will have

$$\frac{r}{f(v',u)}=t \quad .. \quad .. \quad \text{(ii)}$$

because observations in either case of time (and space) intervals by means of identically constructed clocks (and measuring rods) marking absolute time must be the same for two *distinct* events like the departure and meeting of two bodies. Whence $f(v',u)\equiv v'-u$. Further discussion follows.

How was Sir Shah Sulaiman led to his view? I think the clue to this is to be found in a remark of his, in the first two presentations of the theories, that Einstein might well have first hit at the relativity formula for relative velocity $\left(\frac{v'-u}{1-v'u/c^2}\right)$ and then "working *backwards*, reached the time and space relationships of his theory". Now the fact is that Einstein must first change fundamentally our ideas of time and space before he can logically arrive at the new formula for relative velocities (and other results). It is impossible to work "backwards" and reach new consistent laws of movement without first postulating a new scheme for spatiotemporal relations, for otherwise we will be compelled by logic to reject these *ad hoc* "Laws". Further, any expressions developed against the background of absolute space and time must, if they are logically consistent, relapse into classical kinematics or else reveal themselves as simply fantastic. And it must be remembered that the change introduced by Einstein in the classical relation comes in with the insertion of the factor $v'u/c^2$ which is the direct consequence of the new definition, in Special Relativity, of "common" time (see A. Einstein: *On the Electro-dynamics of moving bodies*, 1905) for two places, not in the immediate neighbourhood of one another, through the velocity of light. Even this Relativity formula, if $c \to \infty$, and thus space and time can be considered as absolute, gives $f(v',u)\equiv v'-u$. A newer and logically satisfying theory

of time would no doubt produce different consequences but Sir Shah Sulaiman has paid singularly scanty attention to this most important and involved problem. He comes to the subject once (casually) and calculates the total time spent by a messenger to traverse to-and-fro between two moving objects. This gives the time spent in the to-and-fro journey with the only novelty that the messenger's speed is D instead of something else. What is required, if a new view of kinematics is to be reached, is a fundamental and logical comprehension of "time" and not a unit or standard deviously evolved to measure absolute time's flow, which procedure merely mars the beauty and simplicity of the classical conception.

2. Sir Shah Sulaiman modifies Newton's law of gravitation on the ground that the speed of propagation of gravitational influence is finite —a contingency, according to Sir Shah Sulaiman, not reckoned by Newton—and therefore, it has to overtake the moving planets, etc.

I pointed out that, with the enormous speed, D, which Sir Shah Sulaiman ascribes to it, gravitational influence has already spread far and wide and there is no question of its overtaking, at least, the planets. Sir Shah Sulaiman has replied that I could have been right but unfortunately the solar system as a whole is moving through space and thus the modification is still needed.

Let us ignore the propriety of this belief and discuss the subject in itself. The objections are two-fold, the first in a narrow sense and the second of a different character.

(*a*) Though Sir Shah Sulaiman now justifies the modification in Newton's law on the ground of the motion of the solar system as a whole in space, he has throughout been using the velocities of the planets *relative* to the sun to reach particular results through the modified law, *e.g.*, the angular shifts in Mercury's perihelion positions.

It is indeed difficult to see why individual planets should behave differently according to this law, for it rests on what is common to all of them, namely, the motion of the solar system, regarded as a complex whole, through space.

(*b*) The object of investigation is to seek *the law* of gravitation and not expressions constructed to yield certain spectacular conclusions like the regular changes in Mercury's perihelion positions. Sir S. M. Sulaiman's formulæ cannot furnish the law for one can conspire to vary the nature and speed of the indefinite translation of the solar system through space taking care to correspondingly modify the mathematical expressions so as not to upset the possibility of deducing some celebrated results. Indeed Prof. Einstein himself touches on such possibilities in his Herbert Spencer Lecture at Oxford in 1933: *On the Method of Theoretical Physics* (Oxford University Press, 1933, Price 1*sh.*).

Lastly, Sir S. M. Sulaiman had attempted to construct his expressions for gravitation by using retarded potentials. It was pointed out in my previous paper that his method was, in effect, artificial substitutions, because the theory of retarded potentials cannot be genuinely applied where some of the vital factors are left unkown to be valued afterwards in attempts to deduce some famous results.

Gurgaon, (Punjab), ZAHUR HUSAIN.
July 29, 1940.

A New Comet-tail Band

IT is well-known that the comet-tail bands of CO^+ can be produced in a discharge tube containing helium and a trace of carbon. The presence of hydrogen, however, obliterates these bands but brings about the development of the so-called triplet carbon bands of CO. Since hydrogn can be either introduced or withdrawn by the suitable use of a palladium tube, the same discharge tube can be regulated so as to show either the one or the other of the two band systems belonging to the two molecules. Spectrograms of the triplet carbon bands with such a tube, in the far-red region show also a relatively intense band degraded towards the longer waves and having four heads like the comet-tail bands. Measurements show that it belongs indeed to the comet-tail system and fits into the existing analysis with vibrational quantum numbers (3, 3). The wave-numbers of the four heads observed and of second and fourth heads calculated on this

assignment according to the equation given by Herzberg[1] for this system are given below:—

Q. No.	ν vac. cm.$^{-1}$	
	Obs.	Calcd.
(3,3)	14027	..
	14010	14015·7
	13900	..
	13884	13890·7

The agreement is deemed satisfactory being well within the limits of accuracy of the equation and the measurements.

A search on the plates failed to reveal any band having $\nu\sim$ 14077 cm.$^{-1}$ which is the extrapolated value for the second head of a band immediately above the (0, 0) band in the $v'v''$ table, thus confirming the position given by Herzberg for the origin of the band system. The level A $^2\pi_i$, accordingly lies 1·94 e.volts above the ground state X $^2\Sigma$ of CO+ and the excitation potential of the level starting from CO is 16·0 e.volts.*

Department of Physics, R. K. Asundi.
Benares Hindu University,
October 30, 1940.

[1] *Zeit. für Phys.*, 1929, **52**, 815.

* "This incidentally points out the obvious mistake, due evidently to oversight, in the values of the electronic and vibrational constants given for this level in almost all Reports on bandspectra except W. Weizel's Bandspectren, which mentions the correction necessitated by Herzberg's paper quoted here."

A Correction

In *Current Science* for August 1940 (p. 381), Mr. J. K. Bose of the Calcutta University (Department of Anthropology), has pointed out what he considers some fundamental mistakes in my paper on "A Proposed Classification of the Nasal Elevation Index".

The first mistake according to Mr. Bose was in my using the expression nasal "length" instead of nasal "height". I prefer to use "length" instead of "height" as the former, in my opinion, is much more appropriate than the latter for a description of the measurement involved. There are many anthropologists other than Martin, who have used the expression "nasal length" instead of "nasal height", among whom may be mentioned several of Mr. Bose's colleagues in the Calcutta University:—

(1) Prof. T. C. Das (President-elect of the Anthropology Section of the Indian Science Congress next year) in his paper on "The Wild Kharias of Dhalbhum", published by the Calcutta University, 1931, used the term nasal length instead of height (p. 4). In another paper entitled "The Bhumijas of Seraikella" the same writer used nasal length instead of height (Pls. VIII, IX, X, XII).

(2) Prof. T. C. Raichaudhuri, of the Calcutta University, I find, has also used nose-length in place of height in his paper on "The Khasis", published in the *Cal. Univ. Jour.*, Dept. Letters, XXVI (pp. 249, 252, 257, 261, etc.).

(3) Mr. M. N. Basu, also of the Calcutta University, has done the same both in his paper on "The Bunas of Bengal", published by the Calcutta University, 1939 (pp. 10, 17) and in his *An Introduction to Anthropology* (Calcutta, 1936), written in association with Mr. R. K. Mondal (p. 146). And last, but not the least, may I take the liberty of informing Mr. Bose that he himself has used this expression? On page 71 (1936) of his well-known work entitled "A Handbook of Anthropology" which is prescribed as a text-book for the I.Sc. and B.Sc. examinations in Anthropology of the Calcutta University, Mr. J. K. Bose himself uses the term "length of the nose" instead of "height".

All these works were published subsequent to the Monaco agreement of 1905 and the appearance of the second edition of Martin's *Lehrbuch* in 1928. Mr. J. K. Bose can have no excuse in not following these authorities cited by himself against me, as his work was written fully 21 and 8 years respectively after the publication of the above works.

I am, however, very grateful to him for drawing my attention to the substitution of the word "nasospinale" for "subnasale"—a mistake detected long ago but too late to enable me to annex an erratum in the same issue of the *Journal*. Corrections in ink were, however, made afterwards in the copies of the *Journal* before they were sent out.

S. S. Sarkar.
Bose Institute, Calcutta,
September 14, 1940.

REVIEWS

The Story of Astronomy. By Arthur L. Draper and Marian Lockwood. (George Allen & Unwin, Ltd., London), 1940. Pp. 394. Price 12*sh.* 6*d.*

In this interesting work, the authors have attempted to present, within the limits of a single volume, a concise account of the principal facts of astronomy in a manner suitable to the requirements of the general reader. During recent years, the progress of knowledge in the several branches has taken rapid strides and surveys like the present one are useful in making the information gained by research available to the layman and in giving him an insight into the trends of modern astronomical thought. The book under review possesses certain distinctive features. The authors are curators of the famous Hayden Planetarium, New York, and have wide experience of popular exposition of astronomical topics —a fact which seems to have had considerable influence in the arrangement of material and the method of presentation. The style is simple, the descriptions are vivid and of the guide-book type; and the treatment of most of the topics is adequate for a beginner in the subject.

The book opens with a brief introduction giving the story of astronomy from the earliest beginnings veiled in mythology and legend. The second chapter explains clearly the phenomena connected with the celestial sphere and introduces the idea of parallax. The next chapter is concerned with a general description of telescopes, in the historical order of development, the use of the spectroscope in astronomical observations and the application of photographic methods. The six chapters that follow, deal with the moon, the sun, the solar system, and comets and meteors; and the important facts that are known at present, about these bodies, are set forth in a concise form. The information is generally up-to-date, but it is curious that while describing the solar corona (p. 117), no mention is made of B. Lyots' admirable work on the photography of the corona in the absence of a total eclipse.

Chapters 10–13 are devoted to a variety of topics—stars and their motions, variable stars, novæ and dark stars, star clusters and galactic nebulæ; while in Chapter 14, we have a summary of our present knowledge of the Milky Way and its structure and the phenomenon of galactic rotation.

Next follows an excellent chapter on the spiral and other extra—galactic nebulæ—those remarkable objects that are scattered far out in space beyond the boundaries of our Milky Way system—and the problem of the red-shift of the spectral lines is briefly discussed. The concluding chapter contains short popular expositions of Einstein's theory of relativity and its astronomical consequences, and the conception of an expanding Universe formulated by Lemaitre.

The titles of some of the chapters may appear somewhat novel and read like the head lines in newspapers, as Skyward Ho, Queer Kinds of Stars, Comets and Meteors—Riff Raff of the Sky. The book is on the whole, well written and will form a valuable addition to popular astronomical literature. The get-up is excellent and there are a number of beautiful photographs reproduced to illustrate the text. T. P. B.

Sound. By E. G. Richardson. (Edward Arnold & Co., London), 1940. Third Edition. Pp. iv + 339. Price 16*sh.*

This is a well-known standard book on sound suitable for the degree and honours examinations of our universities. The new chapters that were added in the second edition on impedance, ultrasonics and sound reproduction, have been, in the present edition further extended and brought up to date since it is in these departments that most of the research work in acoustics, in the past few years, has taken place.

The first chapter which deals with the velocity of sound in air, begins with the derivation of Newton's formula and the Laplacian correction. All the experimental methods relating to these are next dealt with, at sufficient length. Sound photography by the Toepters method has been given with details. Anomalous propagation of explosive sounds as well as that of sound in tubes are next treated. The second chapter deals with the mathematics of vibrating systems and their experimental verification, simple harmonic motions, Fourier analysis,

progressive and stationary waves, Lissajous vibrations, undamped and damped, free and forced as well as resonance and reaction in coupled systems and theories of combination tones. Longitudinal and torsional vibrations, transverse vibration of strings and rods form the subject-matter of chapters three and four. The different methods of studying vibrations,—graphic, photographic and stroboscopic—are considered at great length. The interesting "chattering method" of W. H. Bragg for study of small vibrations, such as those of membranes is also included. Then follow, in considerable detail, the study of plucked strings, bowed strings and struck strings. Vibrations of bars, tuning forks, membranes and plates are followed by an account of vortex formation and Acolian tones, subjects of special interest to the author of the book. Vibrations in columns of air as in tubes, pipes, musical instruments like flute, clarionet, oboe bugle and trombone are treated in detail. Heat-maintained sound, analysis of sound in air by means of recorders, resonators and absolute pressure measurements form the contents of the next two chapters.

When a steady force is applied to a body in a conduit, tending to move it along the conduit, there exists a definite relation between the applied pressure and the current produced, called the resistance; this resistance is due to viscosity. When the applied pressure is alternating, viscosity is not the only force opposing the movement of the gas; there is also a factor depending on the frequency. The ratio between the applied pressure and the velocity produced by it, in the more general case, is known as the acoustic impedance by analogy with the electrical impedance, which is the applied electromotive force divided by the current produced by it. This subject is of great interest to the author of the book and the account given is very good. Particular mention may be made of the accounts given of the "annular effect" discovered by the author in tubes subjected to aerial oscillations and the several methods devised by him, his students and others to study impedances. Ultrasonics and subjective sound are next treated followed by the chapter on technology dealing with acoustics of buildings, sound rangings, direction findings, propagation of sound through the earth and echo prospecting.

B. DASANNACHARYA.

Fundamental Processes of Electrical Discharge in Gases. By Leonard B. Loeb. (John Wiley & Sons, New York; Chapman & Hall, Ltd., London), 1939. Pp. 717. Price 42*sh.*

The publication of this book is very opportune. The field of study of electrical discharge in gases has had a historical development quite unique in some respects. With its beginning in the days of the discovery of X-rays (1895) and of the electron (1896), it developed with great rapidity in the ensuing fifteen years. By 1911 and 1914 J. J. Thomson and J. S. Townsend co-ordinated and correlated the many studies in their two classics, the *Conduction of Electricity through Gases*, and *Electricity through Gases*. Due, however, to some technical difficulties and the more interesting developments in the fields of atomic theory, X-rays, ionizing impacts, radioactivity, spectroscopy, etc., the interest in discharge phenomena was not sustained.

Thanks to the technical improvements made possible by the introduction of the pyrex glass, better pumps, induction furnaces, electron tubes and oscillographs the interest in this field has been revived during the past fifteen years. The excellent text-book of V. Engel and Steenbeck, which appeared not very long ago, though quite modern and authoritative, is defective in that the author presents only his own considered views on most of the controversial subjects. In the book under review Prof. Loeb tries to present the reader with all the facts and the several conflicting views, and thereafter throws the weight of his authority in whatever direction it should, in his opinion, go, giving his reasons in each instance. In many of the fields studied the author and his students have been engaged in experimental investigations over periods of many years at the California Institute of Technology.

The subjects dealt with are: Ionic Mobilities, Recombination of Ions, Diffusion of Ions, Electron Mobility, Distribution of Electron Energies in a Gas in Electrical Field, Formation of Negative Iions, Ionization Currents in Gases in Fields below Ionization by Collision, Ionization by Collision by Electron in a Gas, Second Townsend Coefficient, Disruptive Discharge in Gases, Sparks, the Arc and Glow Discharge.

B. DASANNACHARYA.

Indian Indigenous Milk Products. By W. L. Davies. (Thacker, Spink & Co., Ltd., Calcutta), 1940. Pp. vi + 96. Price Rs. 1–8–0.

"The main theme of the book is the full nutritional and commercial exploitation of milk." It presents in a surprisingly small compass all the important information about the scientific principles underlying the preparation of a variety of products like *Khoa, Rabbri, Dahi, Lassi, Butter, Ghee, Cream* and *Channa.* The book is written in seven easy reading chapters. The first which 'deals with the composition and behaviour of milk generally' introduces the readers to an understanding of the methods described in the subsequent chapters. The last chapter is of special interest; it refers to the utilization of part of the Indian milk for the manufacture of 'Western milk products' like *butter, cheese,* and condensed and dried milks including proprietary preparations. The author, who is an acknowledged authority in this field, has advanced views on the subject of adulteration of milk and ghee, and the unsatisfactory state of legislation in the country to combat the evil. It is hoped that these views coming as they do from an experienced worker in the subject will receive the earnest attention of those concerned with the control of adulteration. To the students of dairying and allied sciences, and to the industrialist interested in the manufacture of milk products in India, the book provides an authoritative and reliable source of intensely practical information.

G. N.

"What Engineers Do". By Walter D. Binger. (Scientific Book Club, London), 1940. Pp. 150. Price 4*sh.* (postage extra).

The book under review is a brief but arresting presentation of the works of the Civil Engineer in non-technical terms both in regard to the principles involved and the structures constructed from early times to the present day. Its strong point lies in the way in which the general reader is led from the early beginnings to the most complicated structures of modern times. The book deals with civil engineering works comprising buildings, bridges, highways, railroads, tunnels, dams and waterworks of all kinds. Surveying, mapping and aerial photography also receive treatment in an interesting manner. Engineering is a branch of Science with which every one is connected in almost every walk of life, and I would recommend the book which makes fascinating reading to the general reader.

I cannot help adding that the author would be of great service to the general reader, if he can write similar books on Mechanical, Electrical and other branches of Engineering with which development of industries on modern lines is vitally connected.

K. R. S.

Health Bulletin No. 28—*Rice.* (Manager of Publications, Delhi), 1940. Pages 22. Price As. 2 or 3*d.*

This *Bulletin* is a popular summary of the important scientific conclusions contained in *The Rice Problem in India,* issued under the same auspices. Every aspect of the problem confronting the rice-eating population is dealt with in a simple, attractive manner and the price, annas two, charged for the *Bulletin* ought to place this invaluable publication within the reach of the poorest educated citizen, who ought to do a service in his turn to the wider circle of uneducated people, by informing them in easily understood vernacular all about Rice, which seems to sustain life in health when eaten without bringing it under the influence of industrial civilization, but, once under it, becomes an active agent as disease producer. Can we not preserve Rice from the baleful influences of machine civilization! Its unpolished character seems most praiseworthy.

Ramayana and Lanka—Parts I & II. By T. Paramasiva Iyer. (The Bangalore Press), 1940. Pp. lii + 152. Price Rs. 3–12–0.

Considered purely from the literary standpoint, the book is entitled to praise. The indefatigable industry of the author is worthy of the importance of the subject he has investigated.

If Brahman had conferred on Valmiki the power of visualising the treatment that the future research scholars would accord to his composition, doubtless, he would have prayed to the Creator to take away even the gift of seeing the past events, which he was ordained to record, and which has manifestly led him to trouble. This is an age of criticism, research, analysis and reasoning, and, therefore, positively dangerous to ancient classical compositions. Can not we enjoy an epic poem without its sublimity and its historical, geographical and literary blemishes

being placed on the dissection table? Criticism is a species of harmless literary recreation which provides gratification to the critic and amusement to the author, more often annoyance to the latter and embarrassment to the former.

Two learned University Professors of Sanskrit were not convinced that Mr. Paramasiva Iyer's theories about Lanka were correct but two learned ladies, however, to whom the thesis was submitted, agreed with him that "Ceylon could not be Ravana's hill-top city of Lanka". The book was written not so much because the author was piqued as because he was urged by one of his fair supporters to show her the way to Lanka; and the other Pandita would give Mr. Paramasiva Iyer no peace till he had located Lanka. That the ladies should desire to visit Lanka is just and natural, and that a cultivated gentleman should devote his time and talents to gratify that desire is equally appropriate and laudable.

To the ancients the philosophy of food consisted in freshness, flavour, colour, wholesomeness, cleanliness, texture and cooking qualities. They never bothered about, calories, vitamins, minerals, and proximate principles. Taking then a broader view of food as nourishment, our ancestors did not draw any distinction between food and medicine. So it was with their literary compositions. When they wrote their epics in their mad frenzy, they forgot the rules of grammar, prosody, historical analysis, geographical accuracies and higher literary criticism; they simply abandoned themselves to their unbridled imagination. If you do not have the gift of ecstatic enjoyment, read grammar, books on prosody, literary criticism; logic, statistics, history and geography, but not Ramayana, Mahabharatha and Sri Bhagavatha.

Mr. Paramasiva Iyer has the gift of enjoyment and the gift of criticism. He has produced an excellent book, but no book carries with it universal approbation. His arguments are sound, his conclusion, correct. If statistics and maps are the field of investigation, one can prove anything. On the basis of maps, nobody could have produced a more delightful or more convincing book.

SCIENCE IN WAR

Science in War. Published as a "Penguin Special", by Penguin Books. (Harmondsworth, Middlesex, England), 1940. Pp. 140. Price 6*sh.*

NO better book could have been produced at the present moment. The book is the outcome of the collaboration of twenty-five eminent scientists, whose names are not revealed and every chapter presents a vivid picture of the relation of applied science to the urgent problems of the war. We have read the book with avidity, and we have no doubt that it would be read with equal avidity by those who are interested in science and the Great World War II. One of the fundamental points made clear in the book is that science is not something different from the problems of life either in times of peace or in times of war. When human civilization shifts from the spiritual to the technological path, it becomes obvious that the issue of international conflicts must necessarily depend upon how well and how quickly the gifts of science could be organised for the purpose of overthrowing the evil forces. It would seem that Germany has stolen marches over the rest of Europe, but Great Britain, which has always stood for orderly development of science, will make good all arrears, with her infinite resources in men and material. It will not be long before the Nazis will discover the terrible mistake they have made in provoking the Britons, whose ultimate victory will cure the Germans of all their sociological, political and economic distempers, which have been brooding over Europe till they spread with all the virulence of epidemics, and humanise them ultimately into respectability and civil behaviour. The present war is a clash in ideologies and few will doubt that Great Brtain has always espoused and fought for those ideals, which adorn her national history and her racial character. But when the enemy dehumanises his technique and methods of warfare, there is neither logic nor common sense in your proclaiming that you are reasonable and measured in directing your blows. The cause that you have set out to defend and to uphold must sanctify your means and your

weapons. There is no weapon greater than science: no means more effective than its application.

There are only eight chapters, but each chapter is packed with illuminating criticisms on the policy of neglecting the warnings which led to the tragic events and with practical suggestions for mobilising the resources which scientific researches hold for the successful prosecution of the war, and for the advancement of measures calculated to increase social services in normal times. The needs of the situation are urgent and manifold, and the capacity of science for dealing with them is obviously adequate, yet it would seem that what is actually accomplished falls far short of what could be done. The principal difficulty is that a general and organised approach to the social, economic and political problems of national welfare and existence is practically foreign to the tradition of the civil service managing the affairs of the country. Because of the chilling effects of such an atmosphere, the scientists have not shown any eagerness to see that Governments make the fullest possible use of their science. If the scientists are associated with the civil service as a matter of necessity, probably the obstacles which confront the Government in times of stress would not arise. When war breaks out, industries pass from private to government hands, and the difficulties in their management are simply accentuated, because of the difference in the attitude of scientists, businessmen and civil servants regarding the building of an effective and operative scientific service. The book is a clever exposition of the responsibilities devolving on the scientists on the one hand and the civil servants of Government on the other, and of the co-operation between them in safeguarding and advancing the interests of the country and in successfully solving those intricate national problems arising from times of trouble and travail, whether produced internally or from external sources. Attention is drawn to the serious deficiencies of scientific action in the hope that the pressure of intelligent public opinion will stimulate the power and co-operative activity of the nation in the effective utilization of science.

The second chapter bears the appropriate title "Some Things Science Had Done". Every intelligent person ought to know what is meant by "Substitutes", and how scientists have produced them; the section on "Magnetic Mines" and the "de-gaussing girdle" reads like romance. The evolution of aeroplanes, the control of infection by preventive inoculation must provide irresistible interest for even lay readers. In the succeeding chapter dealing with the contribution of science to the conduct of war, tanks and anti-tank guns have a grim interest; aerial bombardment has introduced the necessity for "Camouflage". The section on Military Morale has an arresting appeal. Chapter IV is an exposition of the achievements of medical science in the surgical department. Chapter V deals with food in all its aspects. The succeeding two chapters are equally important. The subject of the production of munitions and labour problems viewed from the standpoint of output and welfare, and the subject of the machinery of administration in handling the prodigious powers which scientific advancement has placed at the disposal of man, provide an analysis of those social and economic problems which demand the application of scientific researches to the maximum benefit of the race.

Civilization is throwing up fresh problems which can be solved only by making the fullest possible use of the scientific resources. These problems become complicated when international conflicts break out and they can be best tackled by science. This is the authoritative statement of the book.

THE CENTRAL BOARD OF IRRIGATION IN INDIA*

THE Tenth Annual Meeting of the Board was held at Delhi on 9th November 1939, and the following from the Presidential Address on this occasion will bear repetition.

> "We are now reaching a stage when the value of this body as a co-ordinating one for the results of research and experiment is becoming very apparent. Hydrodynamic experiments have been giving results which can be easily appreciated even by the layman. Diffusion of effort has been minimised by the existence of a Central Hydrodynamic and Research Station and by the opportunities given to discuss results and programmes at the meetings of this Board and the meetings of Research Officers held at Lahore and Simla. It is highly desirable that Research Officers should be in touch with field condition and for that reason, if no other, it is hoped that it will always be possible to draw a considerable proportion of the Research Officers from Irrigation Officers with an intimate knowledge of field condition."

Mr. Gorden, President, has done well in drawing our attention to this aspect of Irrigation Research. An Irrigation Research Worker may be an Irrigation Engineer with a flare for research or a scientist who has turned his attention to Irrigation Problems. But in India the remuneration which a college graduate can expect if he turns his attention to Science and Educational career is very much less than what he could expect if he turns his attention to Engineering or allied services. This is one of the reasons why an Irrigation Engineer does not want to take up Irrigation Research as his main vocation in life. Because in a field of work where Scientists and Engineers will collaborate it will not add to the efficiency of the work if they are placed in two glaringly different water-tight compartments.

In this connection the following remark of Mr. Gorden is very pertinent.

> "I hope I am wrong, but my opinion is that the new services which are being introduced are not likely to attract the type of man, who is required."

In the new services attempt has been made to make Engineering and Educational services equally attractive. This of course will not attract right type of man for the Engineering services from outside India; but Indian Technical colleges produce now-a-days enough men of this type to man all such services.

Mr. Gorden, however, is evidently nervous about these changes. He says, "We are living in a period of transition, when the officers who have built up India's irrigation systems are being replaced by Indians who have a different upbringing and have not the same opportunity for being in touch with practical engineering from an early age. Their task will be a difficult one, particularly in the early stages, but with the help and guidance of the officers at present in service, it is to be hoped that a standard of efficiency will be maintained which will prevent any deterioration in our irrigation system".

This statement is not correct at least for irrigation services. When an engineer from England used to be appointed to this service his acquaintance with the practical aspect of this line was as poor as that of an Indian Engineer from Roorke or Sibpur. In spite of that they have succeeded and it is hoped that Indian Engineers will improve upon their record.

Reports from the following five Research Stations have been given in abstract.

1. The Central Irrigation and Hydrodynamic Research Station, Poona.
2. Punjab Irrigation Research Institute.
3. Development and Research Division, Sind.
4. Poona Irrigation and Research Division.
5. United Provinces P.W.D. (Irrigation) Research Section.

Of these, Development and Research Division, Sind and United Provinces P.W.D. (Irrigation) Research Section are comparatively new and their activities are also limited. In model experiments they have been mostly confined to sectional models though Sind had been trying rigid geometrically similar three-dimensional models. They claim that their model results so far as silt distributions are concerned are faithfully reproduced in the prototype. This is an aspect of the problem that requires careful and exhaustive examination.

When the Government of India undertook to finance the Central Irrigation and Hydro-

* *The Annual Report of the Central Board of Irrigation, India*, 1938-39. (Manager of Publications, Delhi), 1940, Pp. iii+185.

dynamic Research Station, Poona Irrigation and Research Division was created and taken up by the Bombay Government. This station deals with all irrigation problems that do not concern hydraulics. Most of the research work done by this Division is very closely related with agricultural subjects.

Work of the Central Irrigation and Hydrodynamic Research Station, Poona, has considerably increased during the year under review. Demand for model experiments are increasing as engineers are coming to realise that model results can be relied upon. Simple model experiments such as for scour below falls, can be carried out successfully in stations with moderate equipment. The technique for such experiments have developed to such an extent that in bigger hydraulic laboratories they are undertaken as routine work. It is only when more complicated experiments such as those of river training or silt exclusion at headworks are concerned that the usefulness of the Central Station is felt. Besides the Punjab Irrigation Research Institute, this is the only Research Station in India which is dealing with such complicated problems. The science of such model experiments is as yet very imperfectly understood. It will require years of patient study to make it an exact science. Of course, as it is it can give very valuable indication of what is going to happen in the course of a river if certain conditions are fulfilled; but the technique of such experiments is so complicated that only experienced research workers should undertake them. A case in point is the Punjab Irrigation Research Institute experiments with spurs. Mr. Thomas of the Central Irrigation and Hydrodynamic Research Station, suggested in this connection (p. 17) "that the results obtained, though of great interest and particular application in the case concerned are not of general application unless discharge is considered as a factor. The placing of spurs must depend on the natural meander length of the channel which is approximately as $\sqrt{Q}$. Thus the flow lines shown in the photos differ in the case of $l = 700$; $d = 2{,}000$ from that of $l = 500$; $d = 1{,}500$, though the d/l ratio is nearly equal".

Among the "Basic Experiments" given in the report of the Central Station there is the mention of a hot air anemometer to detect turbulence. This instrument had been used in water previously by English and German Scientists with no great success. It will be of great scientific interest to know the details of this instrument if it is working satisfactorily at the Poona station.

The Punjab Irrigation Research Institute deals with all problems that touch even the fringe of Irrigation. On page 13 of the Annual Report we find:

"An investigation which is of considerable importance in connection with the interpretation of well records concerns the negative pressures developed in water films surrounding soil particles. It has been shown that wells are probably acting as manometers. In the field the greatest negative pressures are developed during the hot weather. The rainfall during the monsoon period flattens the concave minisci of the water films thus reducing the pressure deficiency. As a result the water in the well shows a considerable rise which is out of all proportion for the rainfall received. The rise in well levels during the monsoon period does not therefore represent addition of water to the watertable."

This seems to question the validity of all well records specially after a spell of dry weather. It will be interesting to know if these observations have been confirmed at other places and if they do not depend on the nature of soil crusts.

On going through this interesting Annual Report one is struck by the fact that there is practically no mention of Bengal, Bihar, Orissa or Assam. It appears as if these provinces have no irrigation or river problems. Neither have they any Research Station of their own nor do they refer anything to the Central Station. People often wonder how provinces like the Punjab or Sind spend so much on irrigation research while provinces like Bengal do not spend even a single farthing on river research. It is because the Punjab Government finds that every rupee spent on irrigation research brings more than its full value in return while the Bengal Government knows full well that money spent on river research might bring prosperity to the country-side but it will not add directly to the Irrigation Revenue. It is this difference in the return value of the money that makes the two Governments act so differently. In the United States of America however lakhs of rupees are spent every year for river research because there millions of dollars worth of private properties are involved in a flood such as that of the river Mississippi or Ohio.

THE MARKETING OF COFFEE IN INDIA

AMONG the many lines along which the problem of low prices of coffee is being attempted to be solved by the Indian Coffee Cess Committee is a survey of the present marketing conditions of coffee so that the scope for practical action in this all-important branch of the industry may be determined on reliable and accurate data. The survey has been conducted as part of the marketing surveys of the Agricultural Marketing Officer of the Government of India and the result is now published as *Bulletin* No. 21—*Marketing Series*. As about one-third of the coffee produced in India is exported abroad the survey gives relevant particulars regarding the marketing methods in these foreign markets also. The survey relates also to Burma, although the industry there is a very small one and Burma is in any case no longer in the picture as an Indian province.

The area under coffee in India is estimated at a little over two lacs of acres and the production about 5·8 lacs of cwt., valued at about 1½ crores of rupees. The import of raw coffee is forbidden and this embargo acts as an efficient measure of protection. The export market absorbs the best grades and its value is nearly a crore of rupees or about two-thirds of value of the total crop though the quantity is only one-third. The core and centre in the situation is the extraordinarily low *per capita* consumption in India and the fact that even this is confined to some of the South Indian districts leaving the rest of this province and practically the whole of Upper India untouched by the coffee habit. The *per capita* consumption for the whole of India is only about 0·13 lb.; the Report rightly says if this could be increased by even so small a quantity as 0·15 lb. per head the entire coffee produced in India could be easily absorbed in this country itself. The development of the home market is indeed the most promising line of action and there is much useful information in the survey which indicates what practical steps can be taken towards this end. We refer especially to the development of the trade in ground coffee and even some of the manufactured products, not to mention the excellent propaganda of the Committee which is already proving successful. A guarantee of purity such as the AGMARK standards imply should be a primary requisite and one may hope that the legislation against adulteration passed in recent years in all the provinces will have the desired effect and ensure this important requisite. About 70 per cent. of the packages sold as "pure coffee" were found to be adulterated, to degrees ranging from 0 to 68·5 per cent. and most of them were found unfit to be sold as coffee at all. No wonder this is the greatest impediment to the expansion of the sale of coffee! The Report describes in great detail the packing methods in vogue including the CO_2 inert gas pack which ensures the best method of preventing oxidation and rancidity. The growing tendency even for the housewives of South Indian homes to prefer the ease of the tinned powder to the trouble and nuisance of roasting and grinding at home deserves to be taken note of.

The marketing conditions themselves present as unsatisfactory features as can be met with in any other agricultural product in this country notwithstanding the fact that the coffee industry is largely in the hands of a far better class of people than the ordinary cultivator. Statistics of acreage and production are both hopelessly inaccurate, the difference between the published and correctly estimated figures being over 35 per cent. Market grades are far from standardised; a case is quoted of two curers classifying one and the same lot of coffee exactly reverse of one another! Estates and standing crops are largely mortgaged and interest charges vary from 7 to 25 per cent. Marketing charges on hypothecated crops (including interest) are said to be double those on non-hypothecated crops. The margin between wholesale prices and the grower's share is excessively large, the latter ranging from 55 to 66 per cent. of the former. Mixing of grades, colouring of the beans and similar malpractices also exist; the report offers suggestions to improve matters and secure for the grower a better share of the price. Growers' organisations for effecting direct sale have been few and even those were failures. One hopes that the newly formed Coffee Curing Company in Chickmagalur will afford material relief in this direction and really benefit the grower.

Considerable attention has been devoted to the subject of improvements in the preparation of "parchment" and "cherry" and the suggestion is made that growers should be helped to produce more of the former as the returns on "parchment" are much higher. Mention is made of the efforts made to improve coffee intended for the English market by making it approximate *Costa Rica* in appearance and the writer remembers reading with not a little disappointment at that time that the London market would prefer Indian coffee in its natural imperfection clad in its silver skin. Much space is also devoted to the question of "quality", especially for the London market and despite commendable scientific work, specific gravity and the liquoring test hold the field. It may perhaps be worthwhile to employ temporarily a taster to help in selecting coffees intended for the London market; the matter deserves consideration by the Committee at least as an experiment.

The Report deals with the whole question of marketing in the comprehensive manner which we have learnt to associate with these marketing surveys, and is full not only of information on the various aspects of the industry but also of valuable suggestions for effecting improvements. We congratulate the Indian Coffee Cess Committee on its commendable enterprise in initiating this survey and the Marketing Officer on the care and thoroughness with which the work has been done.

A. K. Y.

CENTENARIES

Carlisle, Anthony (1768–1840)

SIR ANTHONY CARLISLE, a distinguished British surgeon, was born near Durham in 1768. The early part of his medical education was at Durham under Mr. Green, founder of the hospital of that town. He completed his education under Mr. Watson of the Westminster Hospital where he succeeded him as surgeon in 1793. He continued in that post till his death. From 1808 he also held the post of professor of anatomy to the Royal Academy.

Carlisle was a good surgeon. His introduction of the thin-bladed, straight-edged amputating knife, in place of the old clumsy crooked one, and his use of the simple carpenter's saw make his name worthy of note. The number of papers he contributed after 1800 were 17. The last one entitled *Some observations tending to demonstrate the dependence of vascular organisation upon physical causes* appeared in the *Reports* of the Guy's Hospital of 1840, the year of his death. In 1804 and 1805 he delivered the Croonian lectures on *Muscular motion* and *Muscles of fishes* respectively.

Carlisle contributed to other fields of knowledge also. For example, in 1800 he collaborated with W. Nicholson in his researches on voltaic electricity and is credited to be the first in observing the decomposition of water by the electric current.

The chief of his published books are *An essay on the disasters of old age, and on the means of prolonging human life* (1817); *Alleged discovery of the use of the spleen* (1829); and *Physiological observations upon glandular structures* (1834).

Carlisle was very early elected on the Council of the College of Surgeons. In 1800 he was elected a fellow of the Royal Society. He was surgeon to George IV, when he was prince regent, who conferred knighthood on him at the first levee he held after he became king.

Carlisle died at his house in Langham Place November 2, 1840.

Brashear, John Alfred (1840–1920)

JOHN ALFRED BRASHEAR, an American instrument maker, was born of a saddler at Brownsville, Pa, November 24, 1840. His maternal grandfather who had a passion for astronomy taught the boy the constellations by the time he was eight; he also presented him in 1850 with a set of Dick's *Works* and paid for a first view of the heavens through a telescope. About this Brashear wrote later: "Young as I was, the scenery of the moon and the rings of Saturn impressed me deeply". From 1856 to 1881 he was engaged in various pieces of hard work. But the memory of the beauty of the first vision of the heavens persisted so much that he decided to make a telescope for himself as he was too poor to buy one.

He knew nothing about the polishing of lenses, but he brought a glass for a five-inch lens and some books on the grinding of lenses. After toiling in the factory throughout the day Brashear would spend long hours in the night in polishing the glass. This he did for three full years and at last he realised his ambition. From this modest beginning he rose to become the peer of any maker of astronomical and other instruments of precision.

This telescope he made for himself brought him into touch with astronomers and in 1881 he set up independent business as maker of astronomical instruments. It is impossible to estimate accurately the progress in astronomy due to his mechanical genius. To-day his glasses are still in use in most of the observatories of the world.

Brashear's mastery of the art of making a plane surface was marvellous. The speculum metal plates from which the famous Rowland Diffraction Gratings were made required a very accurate surface. The error had to be less than one-fifth of a light wave or one two-hundred-thousandth of an inch. Surfaces of such evenness were produced by Brashear.

Another great contribution to science is the Brashear Method of silvering mirrors, which was of immense use in the design and development of the spectroscope.

His personality even overshadowed his mechanical genius. To literally thousands of people he was known familiarly as "Uncle John". The force that dominated him was a sincere desire to share the beauty of the universe with all mankind. He was one of the three men selected by Andrew Carnegie to draw up plans for the Carnegie Institute of Technology. When Henry C. Frick decided to make his gift of half a million dollars to establish the Frick Educational Commission, he stipulated that Brashear should direct the organisation. Such was his geniality and the confidence that his conduct had induced in others.

Brashear died April 8, 1920.

University Library,
Madras. S. R. RANGANATHAN.

CONTROL OF LANTANA THROUGH INSECTS*

THE insect enemies of Lantana are numerous, though considerably varying in their relative importance as being destructive agents. The question of the actual extermination of the weed by the use of certain of its more effective insect enemies, is a very old one, having been thoroughly examined long ago principally in Hawaiian islands, in Fiji and Australia. The peculiar geographical positions of Hawaii and Australia and Fiji, apart from other factors, rendered the importation of efficient insect enemies from Mexico and their establishment in those islands very successful, with the result that the spread of lantana there was greatly checked. Complete extermination, of the weed, has, however, never been claimed even in these countries.

In India a serious beginning in the matter of investigating the possibilities of checking the spread of the weed was made in 1916. An exhaustive survey of the indigenous enemies of lantana was made. No definite action was, however taken, presumably because, no particular insect enemy appeared to be of any considerable importance in successfully checking lantana, and the then Imperial Entomologist was thoroughly against the importation of new insects from outside.

In 1921, however, the well-known lantana seed-fly (*Ophiomyia lantanæ* Fg.) was imported from Hawaii into Mysore and a few flies successfully emerged out; but attempts to breed them in numbers was not successful; later attempts did not meet with any better success either. No further notice was taken and it was believed that the few flies in question soon died out. But in 1932 it was found that the fly could be reared out of ripe lantana berries not only in Mysore but in various parts of India and even Burma, in spite of the fact that the presence of the fly in India had not been made out in the original survey in 1916. Although the incidence of the fly in the different areas was negligible, the very presence of the fly was thought significant. Whether the fly has all along been a native insect of little importance or whether it has really spread out to distant areas in India and Burma from the small original introduction into Mysore in 1921, is a disputable point. In any case, the seed-fly is not likely to be of any value in checking lantana.

The authors of this volume have thoroughly re-examined the question from all aspects and come to the conclusion that, as matters stand at present, there is "little hope of finding an insect in India that is sufficiently manageable to be used as and when required for local destruction of lantana and that a resurvey of insect fauna of lantana in its original home—Mexico—is inescapable, if complete control of the weed is required, in India". It appears improbable that lantana can, at any time be economically and successfully exterminated, unless by means of a suitable insect enemy —perhaps foreign—as in the case of cactus in S. India.

* "Possibilities of Control of Lantana by Indigenous Insect Pests" by C. F. C. Beeson and N. C. Chatterjee, *Indian Forest Records*, Vol. 6, No. 3. (Manager of Publications, Delhi), 1940. Pp. 41–84. Price Re. 1–4–0 or 2*s*.

SCIENCE NOTES AND NEWS

Excavations at Lauriya Nandangarh.—*Original Manuscripts Discovered*: In the extreme North of the Province of Bihar is Lauriya Nandangarh in the District of Champaran, well-known for the presence of a pillar of the Emperor Asoka, in almost complete preservation marking one of the sites of the pious king's visit from his capital near Patna to the birth-place of Buddha. The name Lauriya strictly applies to the village near the 'laur' or 'pillar', the neighbourhood of which is dotted by a number of mounds, which were some time ago examined by the Archæological Department.

Nandangarh is the name of a large *garh* or fort, lying at some distance from Lauriya and thickly covered with jungle. This has been regularly excavated by the Department during the last five years and has brought to light a stupendous monument unequalled for its size and the earliest prototype of the architecture of the Burmese and Malayan stupas and the well-known Borabudur monuments in Java. The plan of the monument is a huge square cross with a number of projections in between the arms of the cross, and, as in the great temple at Paharpur, there are also several terraces rising one above the other, although the evidence of the finds shows Paharpur to be much later in date than the Nandangarh mound.

A Buddhist Monument.—The religious character of the monument at Nandangarh was not clear till the excavations conducted recently brought to light certain finds in the centre of the mound. On the assumption that the monument must have been erected by the Buddhists a shaft was dug in the centre and at a depth of some 36 feet from the top a complete stupa, which was planned as a miniature of the exterior of the monument, was uncovered. This was surrounded on all sides by a low platform at the foot of which was found a copper casket containing a strip of white muslin with fragments of a birch-bark manuscript and small pieces of wood and carnelian beads. As the manuscript had been forced into the casket, it was found impossible to open the individual leaves without breaking. These have been found to contain certain Buddhist texts written in characters of the 3rd–4th century A.D. It appears that the original monument was several centuries earlier than the casket and the manuscript with which it was apparently reconsecrated at a later date.

The present find is, on the whole, the only

one from Eastern India wherein an original manuscript has been recovered, all such discoveries having so far been confined to the North-West of India.

New Calcite Source Discovered.—Messrs. Bausch & Lomb Optical Co., Rochester, N.Y., have announced the discovery of a new source of calcite, or Iceland spar, a valuable optical mineral heretofore imported from abroad; the Company have contracted for the output of a new mine in the San Padro mountains, north-west of Santa Fe, New Mexico.

The discovery by a Mexican prospector of the new source of supply and the interest of E. M. Stanton, a Chicago optometrist, led to a subsidy by Bausch & Lomb through which operations have been carried on.

The scarcity of optical calcite has caused a world-wide search for many years, since the mineral is essential in the construction of all polarizing instruments. With the flooding of the Iceland mine at Helgustadir during the World War, this source which formerly supplied the world has been unproductive for fine crystals. Meager supplies have come from various countries, the most recent from Spain and South Africa, but the total quantity offered for sale has been insignificant for many years.

Officials reported that the new mine had delivered more than five hundred pounds of fine calcite crystals within a period of three months, many of them weighing as high as 40 pounds. An analysis of the output of the new mine indicates that the United States now has a supply of calcite of high optical quality which will serve the country for years.

The physical properties of the mineral must be carefully considered in mining and handling the crystals. One is its perfect rhombohedral form. One misdirected blow may cause incipient fracture throughout the whole crystal and ruin it for optical use. Crystals, or cleavage fragments, less than one inch long and a half inch thick are rarely usable. Each piece must be colourless, absolutely transparent and completely free of inclusions, cavities, or foreign particles.

The most important use of Iceland spar is for the manufacture of Nicol prims, essential optical parts of polarizing microscopes, saccharimeters, colorimeters, polariscopes, and many other instruments vital to research and technology. This type of prism was designed by William Nicol, a Fellow of the Royal Society of Edinburgh, in 1828.

The Imperial Institute of Sugar Technology, Cawnpore.—The Gangetic Valley appears to be the birthplace of sugarcane and although India was well acquainted with its cultivation and methods of preparation of gur and sugar from ancient times, still the consumption of these products seems comparatively less in their home than in Europe and North America. The place of sugar or gur in the Indian diet is partly taken by rice. Within recent years, however, India has developed a marvellous taste for refined sugar and the industry has grown proportionately, favoured by protection and applied science. Cawnpore, sandwiched between two of the noblest rivers, is admirably suited for stationing the Imperial Institute of Sugar Technology, which was created in 1936, on the recommendations of the Sugar Committee and the Tariff Board, from out of the Sugar Section, maintained at the Harcourt Butler Technological Institute. Equipped with all the facilities necessary for undertaking advanced researches in pure and applied branches of sugar chemistry, the Institute has also been serving the needs of the industry in its technical, commercial and statistical aspects. The Institute has accepted the responsibility for the collection, tabulation and analysis of scientific control returns from factories and for making the results of detailed study of these returns available to factories in the form of technical and statistical reports. It is practically the official expositor in India of the latest developments in the sugar industry abroad which, in their application to indigenous problems, are carefully examined in the light of the local conditions. To undertake and successfully to carry out work in all these important departments, the Institute is provided with a competent and enthusiastic band of young scientists, who within the short period of the existence of the Institute have rendered remarkable service.

Preliminary Annual Report of the Public Health Commissioner with the Government of India for 1939.—The publication of the Annual Report of the Public Health Commissioner is necessarily delayed and a brief review of the health conditions in India is welcome. At the same time the growing demand for an early presentation to the public of the picture of changing health conditions from year to year cannot be ignored. The year 1939 was comparatively free from violent outbreaks of epidemic diseases. The campaign for improved health can be maintained and extended only with the co-operation of the people and an informed public opinion constitutes the basis for such co-operation. Few realise that disease is war and health is resistance. The problem of public health therefore like the problem of war is essentially an economic problem. Given a continuous and adequate supply of proper food at a cheap rate to the poor people, pure water, fresh air, decently ventilated houses, efficient and strict supervision of public eating houses, mitigation of road dust and protection of streets from stray animals, a reasonable sanitary sense on the part of the people and municipal vigilance over the drains and disposal of waste, public health may not cause periodic anxiety. Theoretically we admit that they constitute a stronger fortification for the safety of the people than a Maginot Line. On which are we prepared to spend more money?

The Punjab Fruit Journal.—The 1940 number of this Journal is a sumptuous edition, maintaining the high standard of excellence which has characterised its predecessors. There is hardly any branch of Fruit Industry on which there is not an interesting article contributed by an expert scientist. and in its totality the Journal is manifestly encyclopædic in its information. The Chief Editor, Mr. S. S. Lal Singh, deserves unstinted congratulations and his zeal and devotion in disseminating

knowledge about fruit, in its scientific, industrial, economic and physiological aspects,—in English and Urdu,—have secured the close and cordial co-operation of a distinguished band of enthusiastic writers. This is a branch of occupation meant not only for the villagers, but essentially for the educated young men who will find in it, the widest scope for their activity. We have no hesitation that the superlative importance of the subject will secure for the Journal the widest reception and for the organisers the grateful appreciation and encouragement of the agricultural authorities and the educated public, whose active interest it is the object of the Journal to secure and increasingly to sustain.

Annual Report of the Imperial Dairy Expert for the year ending June 1939. (Manager of Publications, Delhi. Pp. 35. Rs. 1–6–0 or 2*sh.*) This report describes the educational, research and commercial activities of the Imperial Dairy Institute and its farms for the year ending June 1939. This year's report has been written on a different plan with the result that it is shorter, and much repetition of material has been avoided.

Sixty-five students received training in dairying and dairy husbandry at the Institute during the year, including 23 diploma, 16 post-graduate (2 batches) and 22 short-course students. Out of 26 candidates for the Indian Dairy Diploma, from the Allahabad Agricultural Institute, 21 were successful.

Research work carried on from previous years and described in previous reports has been continued. Much of this work is long range in nature, such as breeding of dairy cattle, breed improvement, investigations on fertility and heredity, testing of bulls and the defining of milking performance. A description of some of this long range work would be acceptable in the report. There is no doubt that a great deal of data has been collected during the past few years which with proper treatment would supply useful information.

It is suggested that a drawback in this and in previous reports is the lack of description of the results of research work in the text. Every year the work on hand is described but there is very little attention given to the publication of the results or of opinions reached as the result of investigation.

Work on feeding cows on molasses soaked into bagasse shows that this by-product of the sugar industry can be fed up to 10 lb. per head per day, and can replace 3 lb. of concentrates.

The investigations on milk and its by-products comprise bacteriological and chemical examinations of milk, the manufacture of butter, ghee, dahi and khoa. The renneting properties of extracts of the fruits of *Withania coagulans* and the properties of the cheese so made have been studied and have given results worthy of future elaboration. Various pieces of machinery and equipment have been tried out for efficiency.

The profitable commercial activities of the Institute and its farms are the best evidence of the practical training given to the students. The total expenditure reported is Rs. 2·06 lakhs and the receipts Rs. 1·12 lakhs (54 per cent.). The nett expenditure on dairy education for the year cited was thus Rs. 0·94 lakhs. W.L.D.

Indian Institute of Science.—The thirty-first Annual Report of the Council of the Indian Institute of Science is an interesting document; and the fact that there has been a notable absence of all reference to the affairs of the Institute in the public press affords evidence that it is now devoting its energy and resources to the prosecution of its legitimate functions. Dr. J. C. Ghosh, D.Sc., F.N.I., assumed charge of the duties of the Director on 1st August 1939. The total income for the year covered by the Report amounted to Rs. 5,14,080. The expenditure for the same period was estimated at Rs. 5,66,120, but the actual expenditure was, however, only Rs. 5,07,171; decrease was due to savings from items for which provision was made in the budget. In respect of the members of the staff, mention may be made that Dr. P. C. Guha, D.Sc., continued to act as the Head of the Department of Pure and Applied Chemistry. Messrs. B. N. Banerjee and M. Sreenivasaya were in charge of the Department of Biochemistry during the absence of Dr. V. Subrahmanyan on foreign deputation. Dr. H. J. Bhabha of the University of Cambridge was appointed Special Reader in Physics for delivering a course of 25 lectures on Cosmic Rays and Prof. R. A. Millikan gave four lectures on "Experimental Methods and Results of Cosmic Ray Research". Mr. K. Amrita Rao retired from service and his place as Librarian has been taken by Dr. G. T. Kale, D.Sc. The Council have made provision for implementing the recommendations of the Court in respect of instituting researches into industrial problems. The total number of students and other workers during the year under review was 194. Part II of the Report gives a brief descriptive account of the important pieces of research work done in the Scientific Departments together with a list of Scientific Publications.

Report of Indian Lac Cess Committee.—Research work carried out at the Indian Lac Research Institute and the London Shellac Research Bureau during the year 1939–40 has shown considerable progress; during the period emphasis has been laid on the practical application of the results of experiments.

The outbreak of war stimulated a rapid development of the activities of the London Bureau owing to the demands of the Defence Departments for various types of luminous and black-out paints, coating composition for anti-gas clothing, a quick-setting cement for metals, a flexible and grease-proof coating for rubber surfaces, a quick-drying oil-resistant paint for metals, and a quick-drying sea-water-resistant paint.

Experiments in the Indian Lac Research Institute for the production of modified shellac powders for the moulding industry are in rapid progress, as the use of these powders in the making of electro-technical goods and a variety of common household articles, opens up a considerable field for new industries. Further work has been carried out and practical details formulated for the manufacture of the plastic moulded articles, motor car finishes and stoving enamels from shellac. A number of experiments have been designed to minimise the use of imported materials in the processing of shellac for these new industries.

Lac has now been brought under the operation of the Agricultural Produce (Marking and Grading) Act of 1937 and tentative specifications framed for seed-lac have been circulated to the trade interests concerned for opinion. During the year under review exports of lac registered a 20 per cent. increase over the previous year. Production fell from 1,465,000 maunds in 1938–39 to 1,394,000 maunds. At the outbreak of war, prices soared, but after passing through a period of fluctuation had reached a more or less steady level at the end of the year. From Rs. 13 per maund in April 1939 prices touched Rs. 40 in December 1939, and at the end of the year under review stood at round about Rs. 30.

Agricultural Marketing in India (Report on the Marketing of Eggs in India and Burma).—This report is of inestimable value to schools, agricultural and veterinary colleges and other institutions connected with the activities of developing the cottage industries and rural regeneration. Its importance to the administrators and statesmen is no less profound. The subject of rearing fowls and other birds whose eggs are consumed is generally regarded as a branch of agriculture, but we consider that it is perhaps the most important major industry, probably taking precedence over munition factories, which regulates and sustains the health of the whole population, besides providing relief to the pressure of unemployment. A nation that tends its cows, fowls and bees with respect and tenderness is better employed than another engaged in making spitfires, U-boats and tanks. The aggregate cost of eggs marketed in a year amounts to 5·25 crores of rupees, and the value of the birds which produce them equals about 7·5 crores. The report points out that by sheer neglect, about 14 lakhs of rupees worth of eggs are simply not collected in the course of the year. Poultry farming is now in the hands of ignorant and incompetent people in the villages, and if young educated men should take to it and apply their scientific knowledge and training to the problems, the country will have better eggs, better chicken, better health and better spirit.

Marketing of Indian Coffee.—The Agricultural Marketing Adviser to the Government of India in his report on the Marketing of coffee in India and Burma, invites attention to the fact that the import of coffee into the United States has nearly doubled. From 7,657,000 cwt. in 1909–13 it has risen to 15,320,000 cwt. in 1937. The average annual consumption per head has also increased to nearly one and a half times during that period, from 9·6 lb. in 1910–14 to 13·3 lb. in 1937, which points to the ever increasing popularity of the beverage in the United States.

Although more than half the coffee exported from Brazil is taken by the United States of America, "mild" coffee has steadily made headway against "Brazilians" during the last ten years. The imports from British East Africa rose from 3,000 cwt. in 1927 to 135,000 cwt. in 1935, and to 257,000 cwt. in 1936. The East African and Indian coffees come under the same "mild" category; and whereas the East African coffees have taken big strides in the course of a few years, it is regrettable that Indian exports to the United States of America, are negligible.

According to the Agricultural Marketing Adviser, this is entirely due to the absence in Indian coffees of those standard grades which are necessary as a basis for large-scale sales. Differences in commercial descriptions and variations in the size of beans between the contents of different bags are apt to hamper expansion of the market for Indian coffee. It appears that one consignment of 500 bags of Indian coffee imported into the United States of America included 87 different marks, each of which had to be sampled separately and tested by a taster. This makes business difficult in a country where standardised products are essential for the large multiple shops and chain stores.

To stimulate the demand for Indian coffee, both at home and abroad, the Agricultural Marketing Adviser urges the need for the improvement and systematization of existing methods of classification and grading of coffee and strict supervision and control of operation of the rules enforcing the grade standards. We earnestly hope that these recommendations will be immediately accepted, and an ever expanding market for Indian coffee secured abroad.

We wish to invite the attention of those interested to an exceedingly informative and illustrated article on **The Tung Oil Industry of the Unitd States** by M. Ashby, PH.D., of the Imperial Institute. The article (*Bull. Imp. Inst.*, 1940, **38**, No. 1) represents the report of an inquiry carried out in Florida, Louisiana, and Mississipi, at the suggestion of Sir Frank Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies. Information relating to the region of cultivation, the species, soil conditions, climate and topography, cultivation practices, yields, diseases, pests and physiological troubles, treatment and exploitation of fruits and the trade aspects of the tung oil industry, are all discussed in the article.

Indian Apple Juice.—We wish to invite the attention of those interested to Bulletin No. 39 of the Imperial Council of Agricultural Research (price As. 14), which describes a simple and economical method of preparing unfermented apple juice. This is a pleasant non-alcoholic drink for which there is already a small demand in India. The cost of production on an experimental scale worked out to seven annas per 24 oz. bottle, which compares very favourably with the price of imported apple juice.

Dried Blood for Transfusion.—To combat shock through loss of blood, blood transfusion is largely used in modern medicine. Such blood is difficult to obtain in quantity for the treatment of the wounded in the field and other methods are being carefully considered. One of the most successful and promising of these methods is the use of dried blood plasma. Blood to which Sodium Citrate has been added to

prevent coagulation is allowed to settle and the clear liquid drained off. This liquid is dried *in vacuo* to a granular powder and packed aseptically in containers. Before use it is made into a solution with sterile water and given to the patient in the same manner as a blood transfusion. A sample of dried Blood Plasma, the first to be made in India, was shown to the Medical Stores Supply Committee, which discussed the question of its manufacture in India.

Fish Liver Oils from Indian Sources.—Much progress has recently been made in Travancore, Bombay and Madras in the development of fish liver oil schemes for supplying India with substitutes for Cod Liver Oil. The essential factor in these oils is their content of Vitamin A and Vitamin D. As the shark liver oil has ten times the Vitamin A content of Cod Liver Oil it forms a valuable source of Vitamin A. This oil, however, is lacking in Vitamin D so that it is necessary to add this vitamin to it. Vitamin D, a complex chemical substance has, now for the first time, been made in India at the Indian Institute of Science.

Thanks to the munificence of the Trustees of the Sir Dorabjee Tata Charities, it has now become possible to instal a Cyclotron in the Calcutta University for enabling research on atomic structure. According to a report from the **Associated Special Service**, a sum of Rs. 60,000 has been granted to the Calcutta University by the Trustees of Sir Dorabjee Tata Charities on condition that a like amount is made available by the University. The Cyclotron will weigh 70 tons and is expected to cost Rs. 120,000. The research will be directed by Prof. M. N. Saha.

The Currie Scholarship.—The President of the Forest Research Institute, Dehra Dun, has favoured us with the following note on the history of the Currie Scholarship for Indian Forest Students. This scholarship originated in July 1887, when, on the occasion of the Distribution of Prizes at the Cooper's Hill College, Mr. B. W. Currie, who was then Vice-President of the Council of India, made a personal gift of £1,000 of 3½% India Stock in response to a plea by the President of the College for an increase in the number of scholarships available to its students. Mr. Currie left it to the President and Members of the Council of the College to determine the manner in which his gift should be applied, but expressed the hope that the scholarship to be derived from it would be made retrospective to the year 1887.

In October 1887, the Board of the College decided that the endowment founded by Mr. Currie, which had then with his approval been designated the "Vice-President's Scholarship", should be appropriated to providing one or more scholarships in Applied Mechanics, the President of the College agreeing that his own scholarship of £20, which had hitherto been given to Applied Mechanics, should be transferred to Forestry. This arrangement continued until 1892, when owing to the disappearance of certain mathematical scholarships a redistribution of the available scholarships became necessary, and it was decided to assign one part of the Vice-President's scholarship to Applied Mechanics, and the other part to Forestry, and to transfer the President's scholarship to Mathematics.

In 1906 when the College was closed down, and the question arose of what was to happen to its scholarship funds, Professor Schlich represented that Mr. Currie's intention had been to found a scholarship for Forest students, and that the appropriate thing to do would be to give his scholarship to probationers undergoing training for appointment to the Indian Forest Service. This view of Mr. Currie's intention was contested by the President of the College, who was of the opinion that the endowment should be returned to Mr. Currie's heirs, but the Legal Adviser held that such a proceeding would not be proper and after consultation with Mr. L. Currie, it was ultimately decided that the scholarship should be awarded to the probationer who headed the list at the final examination prior to appointment to the I.F.S. The Scheme of 1908 was accordingly drawn up and the scholarship was awarded under it until 1927, when the practice of training I.F.S. recruits in this country on probation came to an end.

The Central Committee of the Anti-Tuberculosis Challenge Shield.—A Central Committee meeting of the Tuberculosis Association of India was held at the Viceroy's House, New Delhi, on the 28th October, under the presidency of H.E. the Marchioness of Linlithgow. Besides some routine matters, the following business was transacted. The Committee approved the award of the Hassan Masud Suhrawardy Memorial Anti-Tuberculosis Challenge Shield for the all-round good work on tuberculosis done during 1939 to the Madura Municipality which competed among 12 others. It was decided to request affiliated Tuberculosis Associations to send half-yearly (quarterly if possible) reports of their activities for incorporation in the tuberculosis news service of the Central Association. The Committee also decided to proceed with the election of five members to the Central Committee from the affiliated Associations. Finally, the Committee resolved to offer to Dr. C. Frimodt-Moller, C.B.E. (Hon.), the present Medical Commissioner of the Association, an extension of appointment by two years on the expiry of his present contract on the 30th April, 1941.

Tuberculosis Clinics.—That if a tuberculosis clinic is to be of maximum benefit, it should be situated in, or as close as possible to, a thickly populated area, is the unanimous opinion of the Committee of experts recently appointed by the Tuberculosis Association of India at the instance of the Government of India, to consider what conditions should govern the selection of sites for such clinics and whether any particular precautions were necessary in the case of clinics situated in populated areas.

The Committee were also of the view that no particular conditions are necessary regarding the distance of a well-conducted clinic from

the nearest house. They recommended, however, that if a clinic is located in a part of a building used for other purposes, the clinic should have a separate entrance.

Indian Coal Industry.—In his Presidential Address before the Sixteenth Annual General Meeting of the Geological, Mining, and Metallurgical Society of India, held on 27th August 1940, Mr. H. K. Nag dealt with the Indian Coal Industry as it exists to-day. After referring to the action taken by the Government of India on the recommendations of the Coal Mining Committee of 1937, Mr. Nag suggests the following measures for the stabilisation and development of the Coal Industry: (*i*) Control and adjustment of output in order to obtain reasonable prices, (*ii*) organisation of marketing the product, (*iii*) better wages and amenities to employees, (*iv*) comprehensive researches on coal in all its phases, low temperature carbonisation and hydrogenation, for proper utilisation of coal, (*v*) rationalisation with an eye to efficiency and avoidance of waste, (*vi*) education of labour for safety and efficiency, and (*vii*) attention to more efficient and scientific methods of mining. He has also suggested the desirability of having a well-thought-out and comprehensive scheme for the formation of a Joint-Stock Company including representatives of all the main coal trade organisations in India and proceeds to point out how such a body can effectively work for the future well-being of the industry.

We have been informed from the Principal, Fergusson College, Poona, that a large collection of reprints, bulletins, memoirs, etc., on **Mycology and Plant Pathology** has recently been presented by Dr. B. B. Mundkur of the Imperial Agricultural Research Institute, Delhi, to the Fergusson College. The collection consists of about 5,250 publications besides complete sets of "Mycology" and "Phytopathology", and several books on these subjects.

Dr. Mundkur started collecting reprints in 1924 and requests from him for reprints must have been received by every mycologist and plant pathologist in all countries where the study of these subjects has made any progress. Reprints of articles by Hemmings, Magnus, Dietel and others were purchased from the booksellers in Leipzig and the Hague before the war. The collection is specially rich in the works of U.S., South American, Finnish, Swedish, German, Swiss, Italian and English mycologists and plant pathologists.

Dr. Mundkur's gift is a valuable addition to the scientific endeavours of Maharashtra in general and Poona in particular. The collection for the present will remain with Dr. Mundkur so that he can use it in his investigations.

At a meeting of the Council of the **National Institute of Sciences of India**, held on Thursday, the 3rd October 1940, in the rooms of the Royal Asiatic Society of Bengal, Calcutta, the following gentlemen were declared to have been elected Fellows of the Institute: *Ordinary Fellows*—Rai Bahadur Dr. K. N. Bagchi, B.Sc., M.B., D.T.M., F.I.C., Chemical Examiner to the Government of Bengal and Professor of Chemistry, Calcutta Medical College. Dr. K. Ahmad Chowdhury, B.A., B.Sc., M.S. (Syracuse, U.S.A.), D.Sc. (Edin.), Wood Technologist, Forest Research Institute, Dehra Dun. Dr. Mohammad Ishaq, M.Sc., PH.D., Head of the Dept. of Physics, Muslim University, Aligarh. Prof. K. B. Madhava, M.A., Professor of Mathematical Economics and Statistics, Mysore University. Dr. D. N. Majumdar, M.A., PH.D., F.R.A.I., Lecturer in Anthropology, Lucknow University. Dr. D. Narayanamurti, M.Sc., DR.ING., A.I.C. F.INST.P., Officer-in-Charge, Wood Preservation Section, Forest Research Institute, Dehra Dun. Dr. Vishwa Nath, M.Sc., PH.D., F.R.M.S., Lecturer in Zoology, Government College, Lahore, Dr. S. C. Roy, D.Sc., Director of the Burma Meteorological Service, Prof. S. K. Roy, PH.D., Professor of Geology, Indian School of Mines, Dhanbad, Prof. N. A. Yagnik, M.A., D.Sc., A.I.C., Professor of Chemistry, Forman Christian College and Reader in Chemistry, Punjab University, Lahore. *Honorary Fellows*:—Sir Rickard Christophers, KT., BT.-COL., C.I.E., O.B.E., F.R.S., I.M.S. (RETD.).

Mysore Dasara Honours.—Among the recipients of distinctions which His Highness the Maharaja of Mysore bestows annually on officers and public citizens for rendering meritorious service to the State are Mr. B. Venkatanaranappa, Retired Professor, Central College, and Diwan Bahadur K. Ramaswamy, J.P., of Bombay Public Works Department. The former was practically the first scientist in South India who conceived the idea of carrying the developments of science to the people in their own language. Besides, his contributions to Kannada literature and to the preparation of Kannada Dictionary are well known to scholars. Diwan Bahadur K. Ramaswamy is blessed by Providence with worldly goods which he has lavishly used in the noblest spheres of service, *viz.*, relief of human suffering and education of impecunious youth. Diwan Bahadur Ramaswamy is awarded the title of Rajakaryaprasakta in appreciation of his disinterested spirit of benefaction, and Prof. Venkatanaranappa as a scholar and disseminator of scholarship. We congratulate them as well as the other recipients who have done equally great service in various capacities.

ASTRONOMICAL NOTES

The Sun will be at the winter solstice on December 22.

Planets during December 1940.—The three planets Mercury, Venus and Mars continue to be morning stars during the month. Venus is slowly approaching the sun in the morning sky and rises about two hours before sunrise. Very near it, can be seen, Mars as a ruddy star of the second magnitude and there will be a conjunction of the two on December 2, the angular distance at closest approach being less than a degree and a half.

Jupiter and Saturn are apparently near each other and are favourably situated for observation, being on the meridian at about 8–30 p.m. The former reaches a stationary point of its geocentric orbit on December 31, when it will resume its eastward motion among the stars.

Saturn's rings can be seen fairly widened, the angular dimensions of the major and minor axes of the ellipse being 44″·3 and 14″·2. A close conjunction of the planet with the moon will occur on December 11. Uranus is slowly moving westward in the constellation Taurus and will be near the meridian at 10 p.m.

The Geminid Showers.—The maximum display of these interesting meteors may be expected about December 10–12. The radiant point is situated in R.A. 7^h 12^m Declination 33° North, in the constellation Gemini. The average hourly number of meteors in this group is about 30.

Minima of Algol.—The star β-Persei (Algol) is a well-known eclipsing variable with a period of 5^d 2^h 17^m and a range of light variation between magnitudes 2·2 and 3·5. Some of the minima that can be conveniently observed, will occur on December 14, 2^h·0; December 16, 22^h·8 and December 19, 19^h·6, (Indian Standard Time). The position of the star is given by R.A. 3^h 4^m·2 Dec. 40° 43″·6 North. The change in brightness is noticeable about an hour and a half before and after the times given above.

T. P. B.

MAGNETIC NOTES

Magnetic conditions during the month of October 1940 were on the whole similar to those during the preceding month. There were 10 *quiet* days, 19 days of *slight* disturbance and 2 of *moderate* disturbance as compared with 8 quiet days, 16 days of slight disturbance and 6 of moderate disturbance during October 1939.

The day of largest disturbance in October 1940 was the 26th when a moderate magnetic disturbance was recorded. The quietest day during the month was the 9th. The characters of individual days are given in the following table.

Quiet days	Disturbed days	
	Slight	Moderate
4, 5, 9-12, 17, 23, 24, 29.	1-3, 6, 8, 13-16 18-22, 25, 27, 28, 30, 31.	7, 26.

One moderate storm was recorded during October 1940 as compared with two storms (one of great intensity and the other moderate) which were recorded during the same period of 1939.

The mean monthly character figure for October 1940 is 0·74 as against 0·97 for the same period of last year.

M. R. RANGASWAMI.

SEISMOLOGICAL NOTES

During the month of October 1940, one great, six moderate and two slight earthquake shocks were recorded by the Colaba seismographs as against two moderate and one slight ones recorded during the same month in 1939. Details for October 1940, are given in the following table:—

Date	Intensity of the shock	Time of origin I. S. T.		Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Remarks
		H.	M.	(Miles)		
1940						
October 4	Moderate	10	06	1550	Near 33° N., 91° E., in Tibet	
4	Great	13	25	10170		
6	Slight	21	09	10030		
7	Slight	12	13	3600		
12	Moderate	00	11	10050		
22	Moderate	12	07	3160		
27	Moderate	11	06	10070		
31	Moderate	10	50	1710		
31	Moderate	16	14	300	Near 22°·5 N., 70°·5 E., in north-west Kathiawar	Felt at many places in Kathiawar. Damage to some buildings reported in Rajkot.

ANNOUNCEMENTS

Third All-India Obstetric and Gynaecological Congress.—The Third All-India Obstetric and Gynæcological Congress will be held this year in Calcutta from the 27th to the 30th December 1940—both days inclusive.

The subjects for discussion are: (1) Anæmia of Pregnancy; (2) Functional Uterine Hæmorrhage; and (3) Maternity and Child-Welfare.

For particulars please apply to the Joint-Honorary Secretaries, Bengal Obstetric and Gynæcological Society, 91 B, Chittaranjan Avenue, Calcutta.

All-India Medical Conference.—The Seventeenth All-India Medical Conference will be held in Vizagapatam on December 27, 28 and 29. A Reception Committee with Dr. B. Tirumala Rao, Superintendent, King George Hospital, as Chairman has been formed for the purpose. Dr. K. S. Ray of Calcutta, General Secretary of the Indian Medical Association is the President-elect of the Conference.

An Industrial Exhibition and a Scientific Exhibition are being organised in this connection and "A Handbook and Scuvenir" of the Conference will be published on the occasion. A series of popular lectures by eminent medical men are arranged.

Arc Welding Research Award.—The *James F. Lincoln Arc Welding Foundation* of Ohio, U.S.A., has announced a "$200,000 Industrial Progress Award Programme" which covers the period extending from January 1, 1940, to June 1, 1942. The programme is briefly to stimulate general industrial progress by encouraging research and study on the subject of arc welding and by rewarding authors of papers judged worthy of award, which report and describe advances or improvements in design, manufacture, fabrication, construction, welding service or maintenance resulting from such research and study.

The *India Society of Engineers* have arranged to serve as local Information Bureau of the J.F.L. Arc Welding Foundation. Those who are particularly interested in arc welding and wish to contribute papers may send for particulars from the Secretary, India Society of Engineers, 7, Clive Street, Calcutta.

Lucknow University.—The following is the programme of Winter Session Lectures for 1940–41:—

December 3, 4 and 5 at 6-30 p.m. (Biology Theatre)—Dr. S. S. Joshi, D.Sc. (Lond.), Principal, Science College, Benares Hindu University: "New aspects of molecular activation".

December 7 at 6 p.m. (Chemistry Theatre)—Mr. M. Raman Nayar, B.A., A.I.I.Sc., Lecturer in Chemistry, Lucknow University: "A chemical method of preventing seepage losses of water in canals".

December 20 at 6-30 p.m. and December 21 at 2-30 p.m. (Biology Theatre)—Dr. J. C. Ghosh, D.Sc., F.N.I., Director, Indian Institute of Science, Bangalore: "The photo-chemical action of polarised light".

December 21 and 23 at 6-30 p.m. (Biology Theatre)—Prof. L. Rama Rao, M.A., F.G.S., Department of Geology, Central College, Bangalore: "The Cretaceous rocks of the Indian Peninsula".

January 9 at 2-30 p.m. (Biology Theatre)—Prof. A. Subba Rao, D.Sc., F.R.M.S., Central College, Bangalore: "The mammalian ovary".

*January 9 at 6-30 p.m. (Biology Theatre)—Prof. M. N. Saha, F.R.S., Palit Professor of Physics, Calcutta University: "Fission of nuclei".

January 10 and 11 at 1-30 p.m. (Mathematics Dept.)—Dr. Ram Behari, M.A. (Cantab.), Ph.D., Reader in Mathematics, Delhi University: "Differential geometry of ruled surfaces".

January 10 and 11 at 6-30 p.m. (Biology Theatre)—Prof. R. Gopala Aiyar, Department of Zoology, University of Madras: "Some aspects of marine biological research in Madras".

January 13 and 14 at 6-30 p.m. (Biology Theatre)—Dr. H. J. Bhabha, Ph.D., Department of Physics, Indian Institute of Science, Bangalore: "Cosmic radiation".

January 15 at 6-30 p.m. (Biology Theatre)—Dr. M. B. Lal, D.Sc., Lecturer in Zoology, Lucknow University: "The early history of helminthology in India".

January 16 at 6-30 p.m. (Biology Theatre)—Dr. G. S. Thapar, Ph.D., Reader in Zoology, University of Lucknow: "Hydatids in animals".

January 17 and 18 at 6 p.m. (Chemistry Theatre)—Dr. A. C. Chatterji, D.Sc., Dr.Ing., Lecturer in Chemistry, University of Lucknow: "The electric double layer and the stability of colloidal solutions".

January 23, 24 and 25 at 6-30 p.m. (Biology Theatre)—Prof. N. N. Sen Gupta, M.A., Ph.D., F.R.S., Professor of Philosophy, University of Lucknow: "The interlacings of the mind: (*i*) The mind and the social setting. (*ii*) The mind and the racial setting. (*iii*) The mind and the geographical setting".

January 30 and 31 at 6 p.m. (Chemistry Theatre)—Dr. S. N. Shukla, Ph.D., Lecturer in Chemistry, University of Lucknow: "Liquid junction potentials".

February 7 and 8 at 6-30 p.m. (Biology Theatre)—Dr. A. N. Singh, D.Sc., Reader in Mathematics, University of Lucknow: "The Lebesgue integral".

February 12 at 6 p.m. (Physics Theatre)—Dr. K. N. Mathur, D.Sc., Lecturer in Physics, University of Lucknow: "The solid state".

February 15 at 1-30 p.m. and February 17 at 3 p.m. (Chemistry Theatre)—Dr. S. M. Sane, Ph.D., Reader in Chemistry, University of Lucknow: "The chemistry of haemin and allied substances".

February 20, 21 and 22 at 6-30 p.m. (Biology Theatre)—Dr. R. D. Misra, Ph.D., Lecturer in Mathematics, University of Lucknow: "The stability of crystal lattices".

February 27 and 28 at 6-30 p.m. (Biology Theatre)—Mr. Kali Prasad, M.A., LL.B., Lecturer in Philosophy, University of Lucknow: "Psychological typology".

All the lectures will be illustrated.

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*These dates are provisional.

ACADEMIES AND SOCIETIES

Indian Academy of Sciences: (*Proceedings*)

October 1940. SECTION A.—V. SURYAPRAKASAM: *Effect of temperature on the ultrasonic velocity in liquids.* Eleven organic liquids have been studied over range 30° C. to 120° C. All liquids exhibit a diminution of sound velocity with rising temperature, the rate being of the order of 3 to 5 metres per second per degree. C. N. SRINIVASIENGAR: *Some properties of rectilinear congruences.* M. R. ASWATHA NARAYANA RAO: *Sulphuryl iodide.* Spectroscopic studies indicate that sulphuryl iodide is produced by the action of potassium iodide on a dilute sclution of sulphuryl chloride in CS_2 at −70° C. R. D. DESAI AND V. M. VAKIL: *Heterocyclic compounds—Part XI. The application of the Pechmann and the Kostanecki reactions to γ-orcacetophenone.* S. RAMACHANDRA RAO AND S. ARAVAMUDACHARI: *Diamagnetism of Phosphorus.* The diamagnetic susceptibility observed when white phosphorus is dissolved in carbon disulphide, is larger than the value calculated from additive law. C. J. DASA RAO, T. R. SESHADRI AND J. VEERARAGHAVIAH: *Chemical investigation of Indian fruits—Part II.—The composition of the oil from the seeds of Indian shaddock.* P. SURYAPRAKASA RAO AND P. PRABHAKARA REDDY: *Occurrence of herbacetin in the flowers of the Indian tulip* (Thespasia populnea). Both populnetin and herbacetin are present, and their relative proportion seems to vary considerably depending on the season of collection of the flowers. S. RANGASWAMI AND T. R. SESHADRI: *A note on certain constitutional factors controlling visible fluorescence in compounds of the benzo-pyrone group.* A hydroxyl group in 7-position causes fluorescence in the coumarins. P. S. VARADACHARI: *Secondary electron emission of nickel at the Curie point.* No sudden alteration in the secondary electron current was observed at the Curie point (358° C.). R. D. DESAI AND (MISS) V. M. VAKIL: *Studies in the Friedel-Crafts reaction—Part VI. Further evidence for γ-substitution in the resorcinol and orcinol derivatives.* V. SEETHARAMAN: *On the existence of a metric for path-spaces of order two.* HANSRAJ GUPTA: *On a table of values of L(n).* M. R. ASWATHA NARAYANA RAO: *Selenium iodide.* Selenium iodide is formed by treating dilute sclution of selenium chloride in CCl_4 with dry KI. B. D. SAKSENA: *Raman spectra of some esters of di-carboxylic acids. Oxalyl chloride, ethyl- and methyl-oxalate, ethyl malonate, ethyl phthalate, ethyl fumarate, ethyl maleate and oxalic acid.*

October 1940. SECTION B.—S. N. DAS GUPTA AND G. S. VERMA: *Studies in the diseases of* Mangifera indica *Linn.—II. Effect of injecting healthy mango fruits with extract from naturally occurring necrotic mangoes.* J. B. S. HALDANE: *The estimation of recessive gene frequencies by inbreeding.* Y. APPAJEE: *A note on the relative positions of the corpus callosum and the hippocampal formation.* JAI CHAND LUTHRA, ABDUS SATTAR AND SARDUL SINGH SANDHU: *Experiments on the control of smut of sugarcane* (Ustilago scitaminea *Syd.*). M. S. RANDHAWA: *Some peculiarities in conjugation in a new Himalayan species of* Zygnema. URSULA PHILIP: *A genetical analysis of three small populations of* Dermestes vulpinus *F.* (*Coleoptera*). JAI CHAND LUTHRA, ABDUS SATTAR AND SARDUL SINGH SANDHU: *Some studies on the physiology of* Cytospora sacchari *Butl., the causal fungus of stem canker disease of sugarcane.*

Indian Chemical Society:

August 1940.—(Late) N. W. HIRWE AND K. N. RANA: *On chloralamides. The reaction of potassium cyanide on α-chlorochloral-chloro-2-methoxy-benzamides and the hydrolysis of the resulting cyano compounds.* MAHAN SINGH AND ARJAN SINGH: *Cyanocamphoranilic acids and their rotatory powers.* S. M. SETHNA AND R. C. SHAH: *Kostanecki-Robinson reaction—Part II.—Propionylation and butyrylation of orcacetophenone and its monomethyl ether.* GURCHARAN LAL JUNEJA, KARTAR SINGH NARANG AND JNANENDRA NATH RAY: *Sulphonamides—Part I.* PRAFULLA KUMAR BOSE AND PHANIBHUSAN DUTT: *On the constitution of pedicinin.* MATA PRASAD AND B. G. SHEJWALKAR: *Viscosity of Thorium arsenate gels during setting.* S. S. BHATNAGAR, B. D. KHOSLA AND RAM CHAND: *Magnetic evidence regarding the state of metallic ions in phosphate glasses.* N. R. DHAR AND E. V. SESHACHARYULU: *Nitrogen fixation and total bacterial count on the application of energy materials to alkali soils.* PRIYADARANJAN RAY: *A note on the reactions and exchange of active iodine in inorganic system.* N. V. SUBBA RAO AND J. VEERABHADRA RAO: *A note on the occurrence of free fatty acids in the cake of* Pongamia glabra.

Meteorological Office Colloquium, Poona:

October 7, 1940.—RAO BAHADUR V. DORAISWAMY IYER: *Formulae for forecasting seasonal rainfall in Mysore and South Madras.*

October 15, 1940.—MR. V. V. SOHONI: *Past climates.*

October 22, 1940.—MR. A. K. ROY: *Isentropic analysis of weather charts.*

ERRATUM

Vol. 9, No. 10, October 1940:

Review Article entitled "Excavations at Harappa", para 5, line 6, *for* "Mr. Vats" *read* "Mr. Mohammad Sana Ullah".

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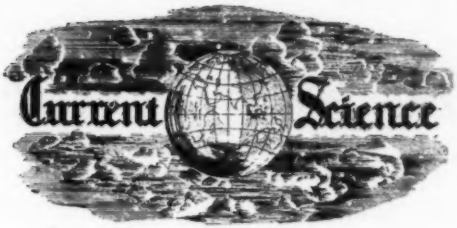

With Best Wishes

for a Happy Christmas

and a Bright New Year.

May it bring peace and

goodwill among mankind.